SERVICE MANUAL
YB GENERATORS AND CONTROLS
200 kW to 350 kW

TABLE OF CONTENTS

ONAN RECOMMENDS THAT ALL SERVICE, INCLUDING INSTALLATION OF REPLACEMENT PARTS BE PERFORMED BY QUALIFIED PERSONNEL.

ABBREVIATIONS

To avoid repetitious use of terms or designations, abbreviations have been used as follows:

R-S-R-	Run-Stop-Remote switch on standard control panel.
R-R-R-	Run-Reset-Remote switch on Penn State control panels.
DDR	Depress during Reset. Instructions on Penn State control panels.
LOP	Low Oil Pressure
HET	High Engine Temperature
LET	Low Engine Temperature
O/S	Overspeed
O/C	Overcrank
R	Resistor/Rheostat
Q	Transistor
CR	Diode or Silicon Controlled Rectifier
K	Relay
VDC	Volts Direct Current
VAC	Volts Alternating Current
N.C.	Normally Closed
N.O.	Normally Open
TD	Time Delay

METRIC CONVERSION

Where applicable customary measurements are followed by metric equivalents. As an aid to interpretation, use the following list.

Customary Units	Metric	Symbol
° Fahrenheit	° Celsius	° C
inch	millimetre	mm
pound-foot	Newton metre	N.m

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SAFETY PRECAUTIONS

The following symbols in this manual highlight conditions potentially dangerous to the operator, or equipment. Read this manual carefully. Know when these conditions can exist. Then, take necessary steps to protect personnel as well as equipment.

WARNING **Onan uses this symbol throughout this manual to warn of possible personal injury.**

CAUTION **This symbol refers to possible equipment damage.**

GUARD AGAINST ELECTRIC SHOCK

Disconnect electric power before removing protective shields or touching electrical equipment. Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when around electrical equipment. Do not wear damp clothing (particularly wet shoes) or allow skin surfaces to be damp when handling electrical equipment.

Disconnect batteries to prevent accidental engine start. Jewelry is a good conductor of electricity and should be removed before working on electrical equipment.

Use extreme caution when working on electrical components. High voltages cause injury or death.

Follow all state and local electrical codes. Have all electrical installations performed by a qualified licensed electrician.

PROTECT AGAINST MOVING PARTS

Avoid moving parts of the unit. Loose jackets, shirts or sleeves should not be worn because of the danger of becoming caught in moving parts.

Make sure all nuts and bolts are secure. Keep power shields and guards in position.

If adjustments are made while the unit is running, use extreme caution around hot manifolds, moving parts, etc.

Do not work on this equipment when mentally or physically fatigued.

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INTRODUCTION

FOREWORD

This manual provides troubleshooting and repair information for ONAN series YB generators. It is intended to provide the maintenance technician, serviceman or Onan distributor with a logical procedure to enable him to systematically locate and repair malfunctions in the generator and control systems. This information is not applicable to the prime mover; refer to the engine manufacturer's manual.

Repair information is not extensive because the plug-in solid-state printed circuit modules lend themselves more to replacement than repair. ONAN does not recommend repair of the printed circuit module, except at the factory and has initiated a return/exchange service obtainable through distributors, whereby faulty modules can be returned and exchanged for good units. For more information, contact your distributor or the ONAN service department.

This manual is divided into two sections as follows:

1. **GENERATOR** - Consists of general specifications on the YB generator, troubleshooting guides and procedures for testing and repairing the systems.
2. **CONTROLS** - Troubleshooting guides, procedures for testing and repairing the system are contained in this section. A description of the components and an analysis of the module circuitry are included.

TEST EQUIPMENT

Most of the tests outlined in this manual can be performed with—

Simpson VOM. Model 260, 262 or equivalent.
Kelvin or Wheatstone bridge ohmmeter.

CAUTION **An equivalent VOM to a Simpson 260 or 262 should have a maximum battery voltage of 6VDC (preferably with size AA batteries), on ranges other than R x 1. Some foreign made VOM's have outputs of 9VDC or 22.5VDC, which are sufficiently high to damage solid state devices.**

CAUTION **Application of meters or high heat soldering irons to modules by other than qualified personnel can result in unnecessary and expensive damage.**

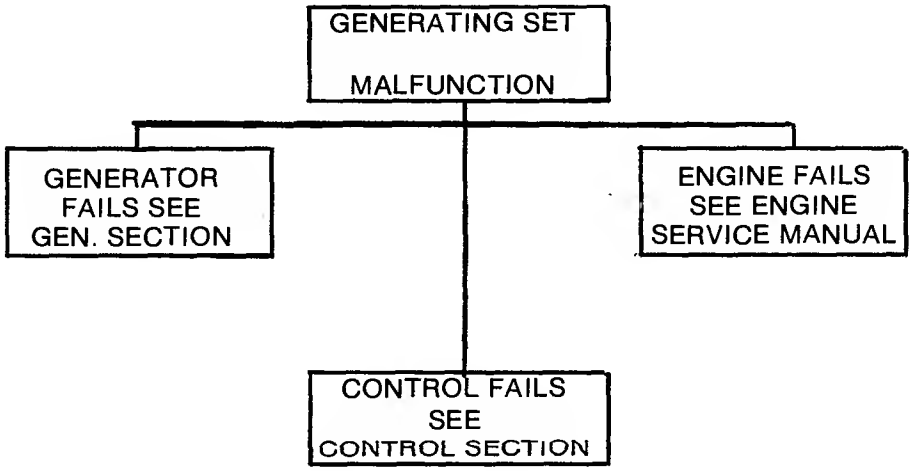

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TABLE 1. YB VOLTAGE/CURRENT OPTIONS

CODE 17	FREQ	MAXIMUM CURRENT (AMPERES) 200 kW	230 kW	250 kW	300 kW	350 kW	PARALLEL WYE	SERIES WYE	SERIES DELTA	REF** XFMR TAP
120/208	60 Hz	694	798	867	1041	1214	x			H3
127/220	60 Hz	656	755	820	984	1148	x			H4
139/240	60 Hz	601	692	752	902	1052	x			H5
240/416	60 Hz	347	399	434	520	607		x		H3
254/440	60 Hz	328	377	410	492	574		x		H4
277/480	60 Hz	301	346	376	451	526		x		H5
CODE 5D*										
120/240	60 Hz	601	692	752	902	1052			x	H5
CODE 6D*										
240/480	60 Hz	301	346	376	451	526			x	H5
CODE 7*										
220/380	60 Hz	380	437	475	570	665		x		H3
CODE 9X*										
347/600	60 Hz	241	277	301	361	421		x		H5
CODE 517		**MAXIMUM CURRENT (AMPERES) 165 kW**	**190 kW**	**208 kW**	**250 kW**	**290 kW**				
110/190	50 Hz	626	723	790	950	1102	x			H3
115/200	50 Hz	595	687	751	902	1046	x			H4
120/208	50 Hz	572	661	722	867	1006	x			H4
127/220	50 Hz	541	625	682	820	951	x			H5
220/380	50 Hz	313	362	395	475	551		x		H3
230/400	50 Hz	297	344	375	451	523		x		H4
240/416	50 Hz	286	330	361	434	503		x		H4
254/440	50 Hz	270	312	341	410	476		x		H5

* - Not reconnectible.

** - Adjust voltage regulator tap on TB21 terminal in control cabinet.

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TABLE 2. POWER OPTIONS

GENERATOR SET	HERTZ	CONTINUOUS STANDBY		PRIME POWER	
		kW	kVA	kW	kVA
DYH	50	165	206.0	140	175.0
DFP	50	165	206.0	140	175.0
DYH	60	200	250.0	170	212.5
DFP	60	200	250.0	170	212.5
DFP	50	190	237.5	161.5	201.88
DFP	60	230	287.5	195.5	244.38
DYB	50	208	260.0	177	220.75
FT	50	208	260.0	177	220.75
DFM	50	208	260.0	177	220.75
DYB	60	250	312.5	212.5	265.6
FT	60	250	312.5	212.5	265.6
DFM	60	250	312.5	212.5	265.6
DFS	50	250	312.5	212.5	265.6
DFT	50	250	312.5	212.5	265.6
DHA	50	250	312.5	212.5	265.6
DFS	60	300	375.0	255	318.75
DFT	60	300	375.0	255	318.75
DHA	60	300	375.0	255	318.75
DFN	50	290	362.5	246.5	308.13
DFU	50	290	362.5	246.5	308.13
DHB	50	290	362.5	246.5	308.13
WF	50	290	362.5	246.5	308.13
DFN	60	350	437.5	297.5	372
DFU	60	350	437.5	297.5	372
DHB	60	350	437.5	297.5	372
WF	60	350	437.5	297.5	372

GENERATOR

GENERAL

The Onan series YB generator is a broad range, brushless, 12 wire, 3 phase unit. Available in the sizes specified in Table 1, it is reconnectible to any of the Code 17 or Code 517 voltage options. Output rating is 0.8 PF.

The broad range characteristic of the generator is that it can be operated continuously in a range of 120- to 139-volts per element and still maintain the same kilowatt output. However, because of prime mover restrictions, primary rating is generally considered to be 85 percent of continuous standby rating. See Table 2.

The 12 wires from the generator are connected to a bus-bar system, where by means of reconnection bars, the Table 1 Code 17 or Code 517 voltage options may be obtained. Refer to Figure 1. To complete the reconnection, a tap on a voltage reference transformer must be selected. Refer to Figure 2. Phase rotation is counterclockwise (ACB).

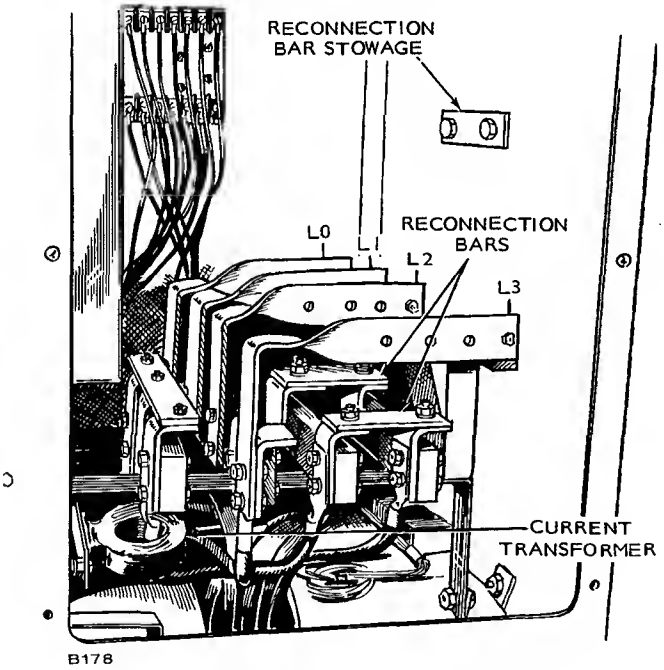

FIGURE 1. RECONNECTION SYSTEM

Excitation and voltage regulation are achieved as follows:

1. Single phase output generated in the main stator winding is fed to input of the voltage regulator (VR21).

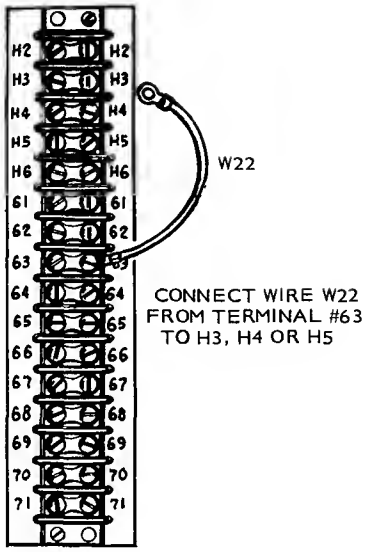

FIGURE 2. REFERENCE VOLTAGE

2. This input is compared with and adjusted to a reference voltage in the regulator, then rectified to DC.
3. This DC voltage is applied to the stationary field of the exciter which energizes the exciter armature and produces three phase AC which is again rectified to DC.
4. The DC voltage is then applied to the main alternator as field excitation current. Refer to Figure 3.

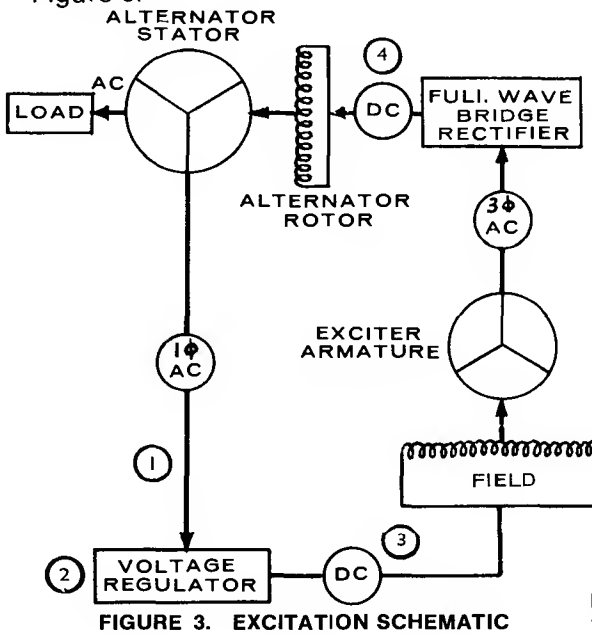

FIGURE 3. EXCITATION SCHEMATIC

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COMPONENT LOCATION

To expose the rotating rectifier assembly (Figure 7), remove grille section. Removal of the side panels behind the control box will allow access to the bus-bars and current transformers (Figure 1). Voltage regulator (VR21), reference transformer (T21), SCR (CR21) and reactor (L21) are located inside the control box. Two fasteners (1/4 turn) hold access doors closed. See Figure 4.

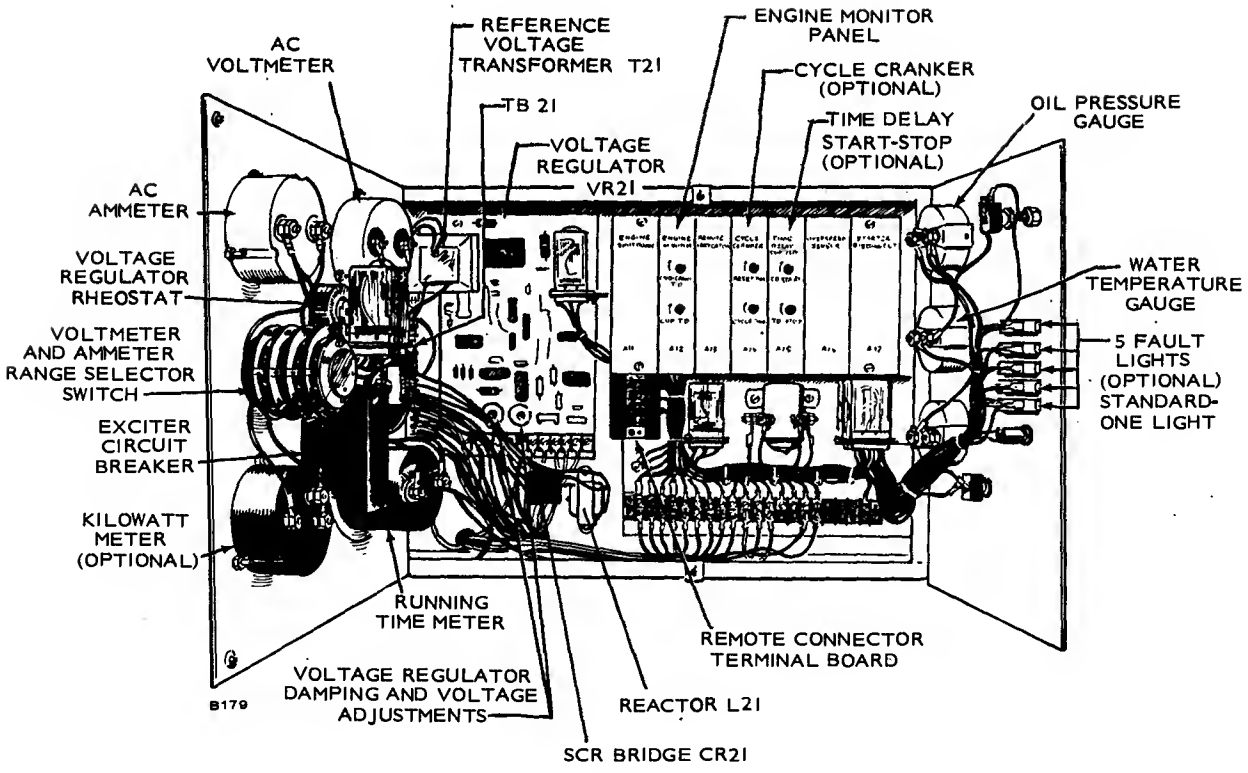

FIGURE 4. CONTROL PANEL INTERIOR

GENERATOR TROUBLESHOOTING

TROUBLESHOOTING GUIDES

A. **CONDITION:** NO AC OUTPUT VOLTAGE
ENGINE RUNNING RATED RPM

B. **CONDITION:** UNSTABLE OUTPUT
ENGINE RUNNING RATED RPM — NO FLUCTUATION

C. **CONDITION:** OUTPUT VOLTAGE TOO HIGH OR LOW

D. **CONDITION:** EXCITER CIRCUIT BREAKER TRIPS

E. **CONDITION:** UNBALANCE GENERATOR OUTPUT VOLTAGE

PREPARATION

A few simple checks could expose the probable source of trouble or at least cut down on troubleshooting time.

1. Check all modifications, repairs, replacements performed since last satisfactory operation of set. A loose wire connection, overlooked when installing a replacement part could cause problems. An incorrect connection, an opened circuit breaker, a plug-in module or relay not secure are all potential malfunction areas to be eliminated by a visual check.
2. Unless absolutely sure that panel instruments are accurate, use portable test meters for troubleshooting.
3. Visually inspect components on VR21. Burned resistors, arcing tracks are all identifiable. Do not mark on printed circuit board modules with a pencil. Graphite lines are conductive and can cause short circuits between components.

The question and answer troubleshooting guide which follows, gives a step-by-step procedure for checking the generator, etc.

To use this guide, answer the question either "yes" or "no" then proceed to the step given in the column containing your answer. When a letter appears in the Method column, refer to that letter in the Procedure section for the recommended method for testing or repairing.

WARNING **Disconnect battery cable before performing any checks on generator. Serious injury could result from inadvertent starting.**

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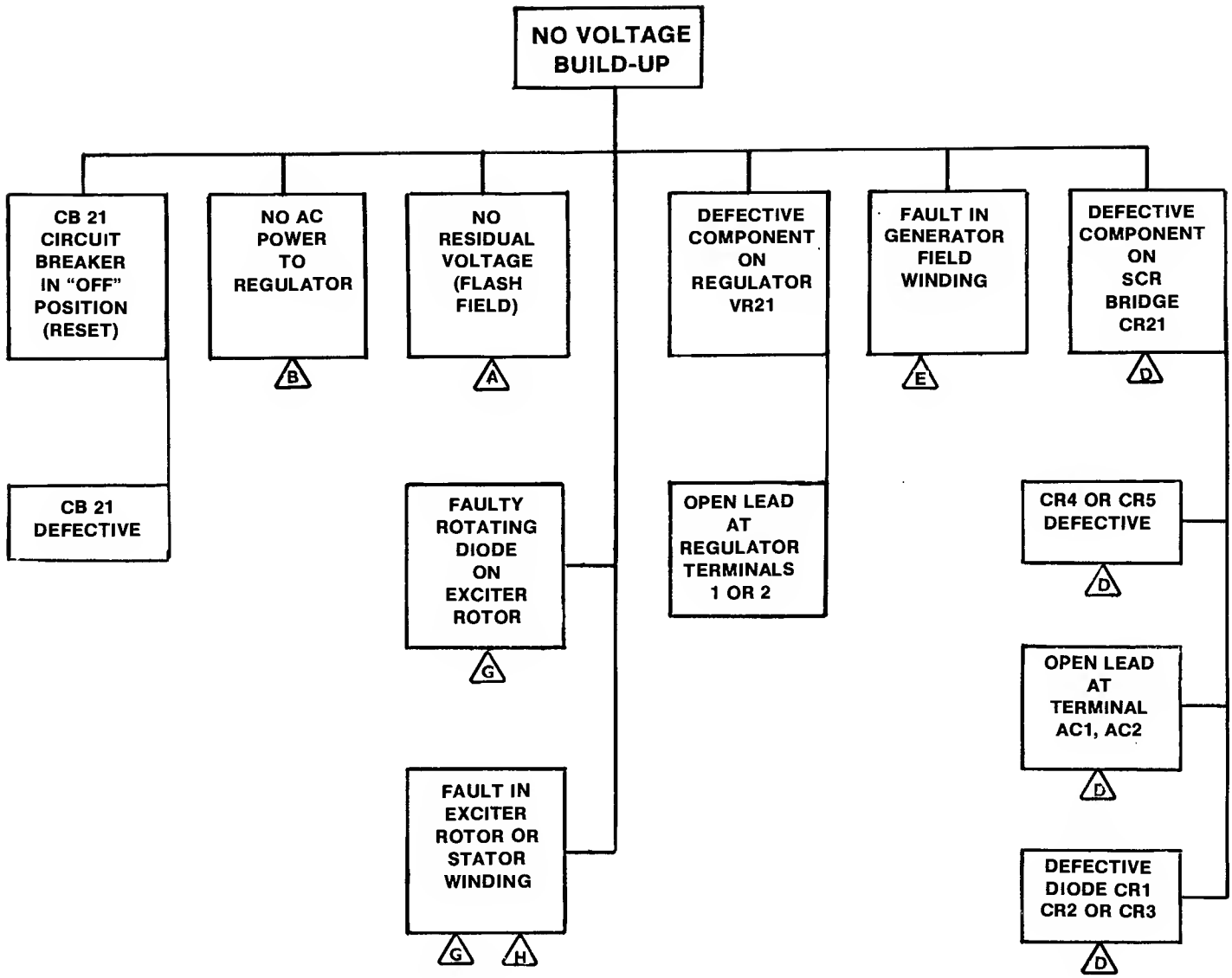
TROUBLESHOOTING GUIDE

ITEM	A. CONDITION: NO AC OUTPUT VOLTAGE ENGINE RUNNING	YES	NO	METHOD
1.	Is the Exciter Circuit Breaker (CB21) on the meter panel in the ON position?	3	2	
2.	Switch CB21 to the ON position. Does the AC voltage build up? **If voltage builds up but is high, low or unstable, or causes CB21 to trip, refer to section B, C or D of the troubleshooting guide.**	—	3	
3.	Is the AC voltage measured at terminals 1 and 2 on voltage regulator (VR21) printed circuit board 5-10 volts?	6	4	
4.	Is the AC voltage measured at terminals 11 and 12 on VR21 5-10 volts?	5	7	
5.	Replace reactor assembly (L21).	—	—	
6.	Is the DC voltage measured at terminals + and - on Rectifier Bridge (CR21) 5-10 volts?	15	11	
7.	Shut down generator set. Check continuity between terminal 2 on VR21 and T8 on generator bus-bar; between terminal 1 on VR21 and T7 on generator bus-bar. Is there continuity between these connections: VR21-2 to T8 VR21-1 to T7	 14 14	 10 8	
8.	If discontinuity exists between VR21-1 and T7 (CB21-ON) apply a shorting jumper across CB21. Is continuity obtained?	9	10	
9.	Replace CB21.	—	—	
10.	Check for loose or broken wires on VR21, CR21, reference voltage transformer (T21), generator bus-bars and terminal Board (TB) 21 in control box. Secure or repair where necessary. If repairs have been made, restart engine. Does AC voltage now build up?	—	14	
11.	Are diodes CR1, CR2 and CR3 on CR21 assembly good? (See method D in Procedure section for checking diodes.) If faulty diode is located, replace CR21.	12	—	D
12.	Are scr's 4 and 5 in CR21 good? (See method D in Procedure section for checking diodes.) If faulty SCR's located, replace CR21.	13	—	D
13.	Fault probably lies with a defective component on VR21. Replace VR21.	—	—	
14.	Start engine. Place CB21 in OFF position. Using method prescribed under "A" in Procedure section, flash the exciter field to restore residual magnetism. Place CB21 ON. Does the AC output voltage build up?	—	15	A
15.	Shut off engine. Is the exciter field winding OK?	16	—	H
16.	Are the rotating diodes CR1 through CR6 on the exciter rotor OK?	17	—	C
17.	Is the main generator field winding OK?	18	—	E
18.	Is the exciter rotor winding OK?	19	—	G
19.	Are the generator stator windings OK?	13	—	F

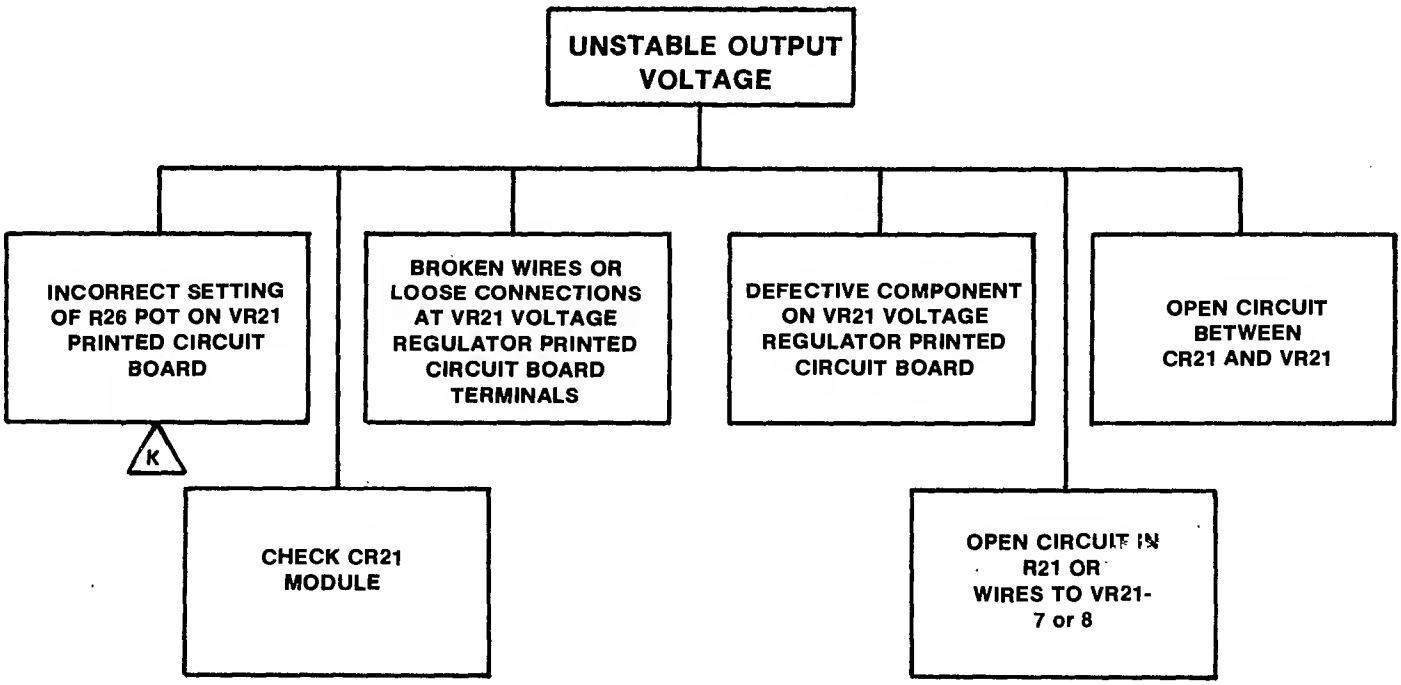
A.



NOTE Whenever a letter appears near the box, a separate procedure, corresponding to that letter, appears at the end of this section.

ITEM	B. CONDITION: UNSTABLE OUTPUT ENGINE RUNNING 1800 RPM — NO FLUCTUATION	YES	NO	METHOD
1.	Does adjustment of R26 (damping control potentiometer) on VR21 stabilize generator voltage?	—	2	K
2.	Are there any loose or broken wires or connections at VR21 terminals?	—	3	
3.	Replace VR21.	—	—	
ITEM	**C. CONDITION: OUTPUT VOLTAGE TOO HIGH OR LOW**	**YES**	**NO**	**METHOD**
1.	Does adjustment of R21 Voltage adjust knob on the meter panel correct voltage level?	—	2	
2.	Does adjustment of R18 potentiometer on VR21 correct voltage level?	—	—	K
3.	Are rotating diodes heat sink mounting screw insulators OK?	—	—	
	If generator output voltage has been optionally reconnected at the bus, consider the following —			
4.	Is the reference transformer (T21) tap correctly connected on TB21?	5	—	I
5.	Are the reconnection bars correctly connected and secure at the generator bus?	6	—	I
6.	Replace VR21.	—	—	—

B.



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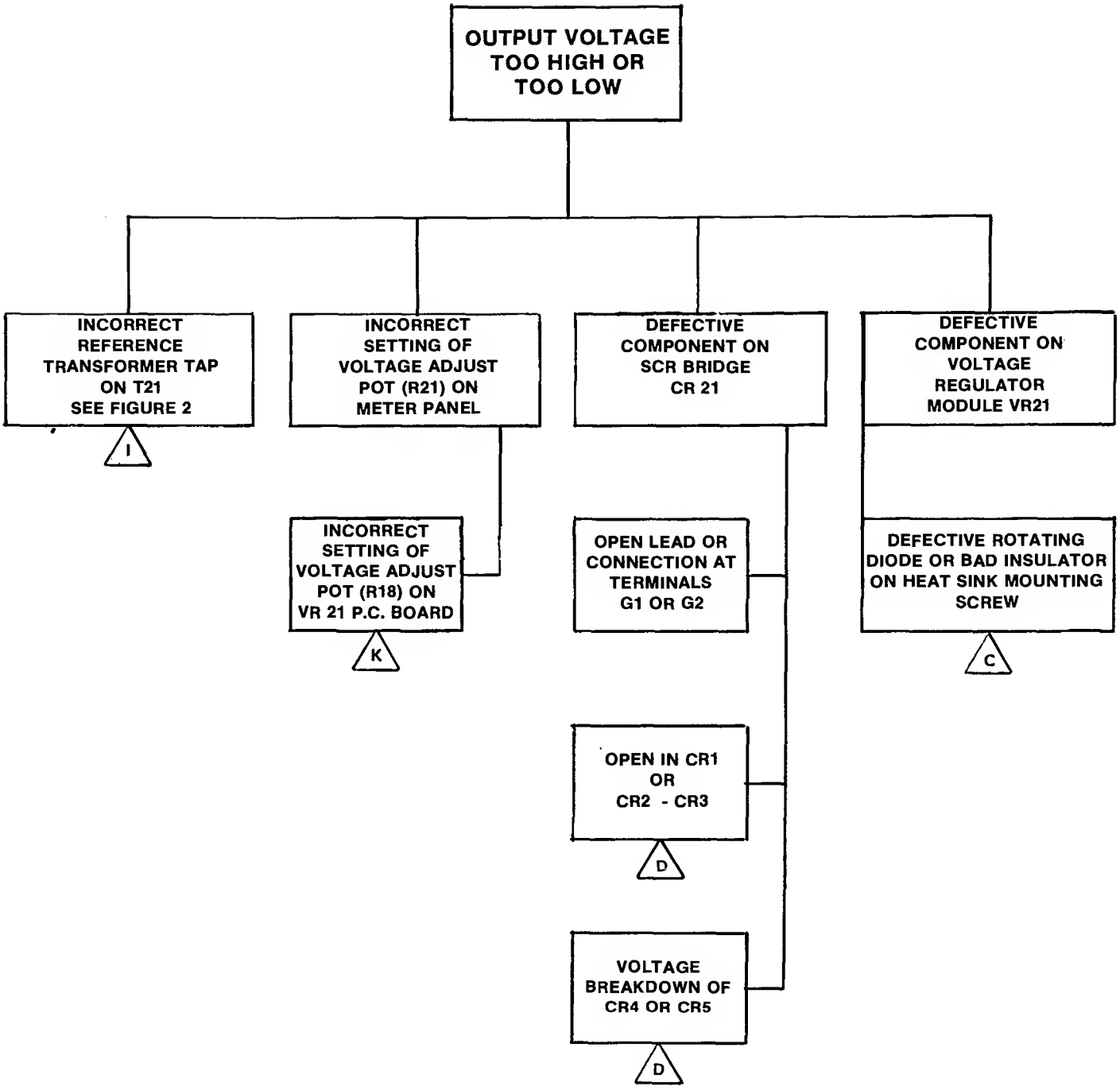
C.

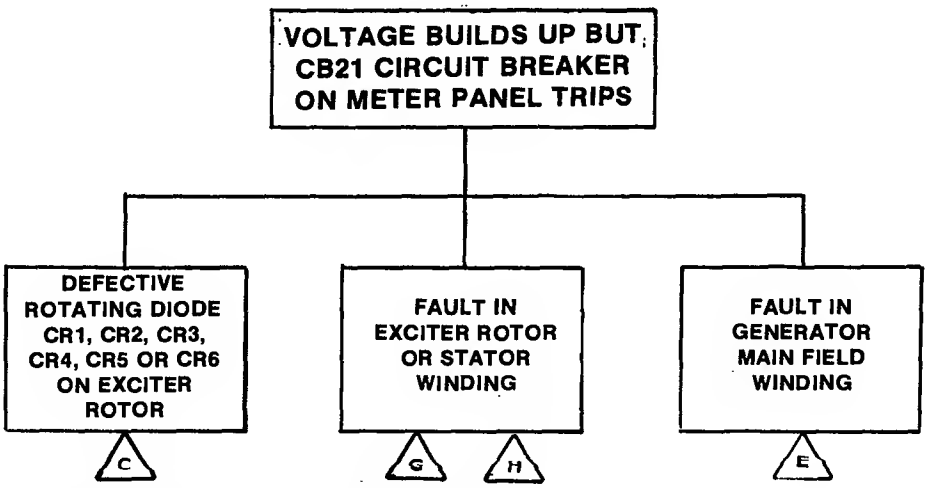


NOTE Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

ITEM	D. CONDITION: EXCITER CIRCUIT BREAKER TRIPS	YES	NO	METHOD
1.	Does AC output build up to 150% or more of rated voltage before CB21 trips?	2	6	
2.	Are there loose or broken terminals or connections at VR21?	—	3	
3.	Is diode CR3 (connected between + and - in CR21 rectifier assembly) OK?	4	—	D
4.	Are the reference voltage transformer (T21) windings and connections OK?	5	—	
5.	Replace VR21.	—	—	
6.	Does AC output build up to rated value before tripping CB21?	7	12	
7.	Are the rotating diodes CR1 through CR6 on the exciter rotor OK?	8	—	C
8.	Is the exciter stator winding OK?	9	—	H
9.	Is the generator main field winding OK?	10	—	E
10.	Is the exciter rotor winding OK?	11	—	G
11.	Replace CB21 circuit breaker.	—	—	—
12.	Test CR21 to method D. Is CR21 OK?	11	13	D
13.	Replace CR21.	—	—	

ITEM	E. CONDITION: UNBALANCED GENERATOR OUTPUT VOLTAGE	YES	NO	METHOD
1.	Remove load from generator terminals. Is output still unbalanced?	2	4	
2.	Are generator leads properly connected or grounded?	3	—	
3.	Is generator stator winding continuous?	4	—	F
4.	Is grounding procedure of generator and load correct?	5	—	
5.	Check for ground faults on load.	—	—	

D.



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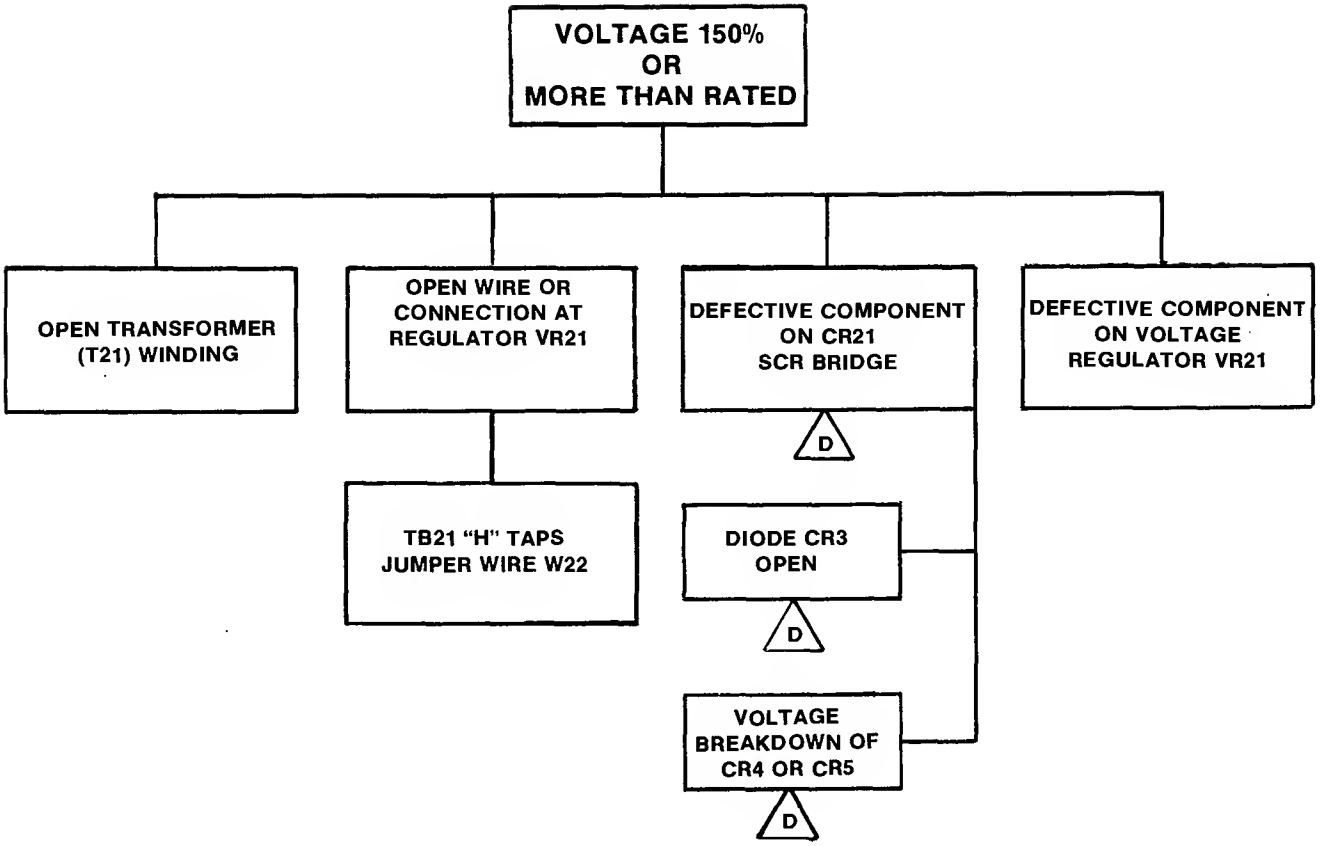
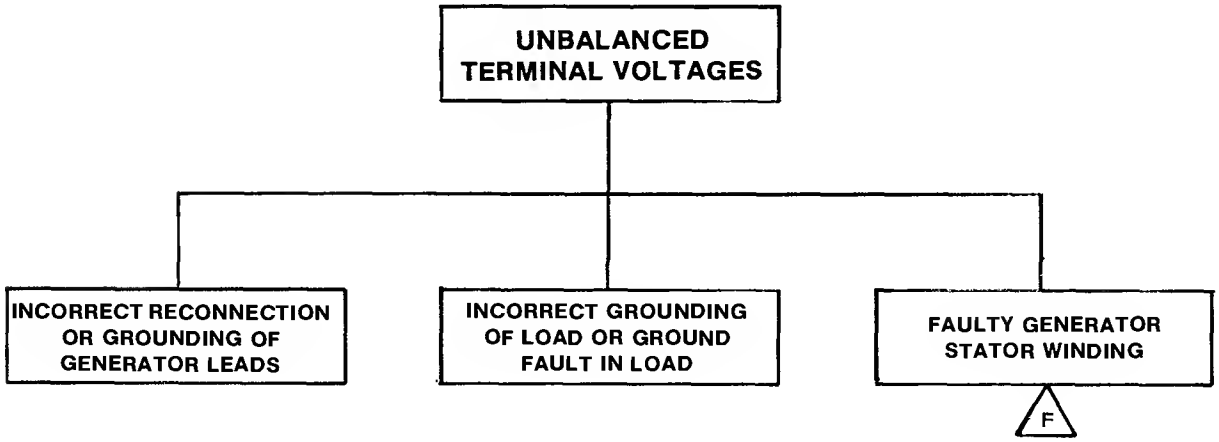
E



F



NOTE Whenever a letter appears near the box, a separate procedure, corresponding to that letter, is given at the end of this section.

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PROCEDURES

[A]

FLASHING THE FIELD

If output voltage does not build up it may be necessary to restore the residual magnetism of the poles by flashing the field. Assemble a six volt supply, resistor and diode as shown in Figure 5. If a six volt supply is not available 12-volts can be used, however a 20-ohm resistor must be substituted for the 10-ohm. Start the generator set, touch positive lead to + on SCR bridge, and negative lead to the – terminal. Hold leads on terminals just long enough for voltage to build up.

CAUTION **Do not keep excitation circuitry connected longer than 5-seconds or damage may occur to exciter and regulator.**

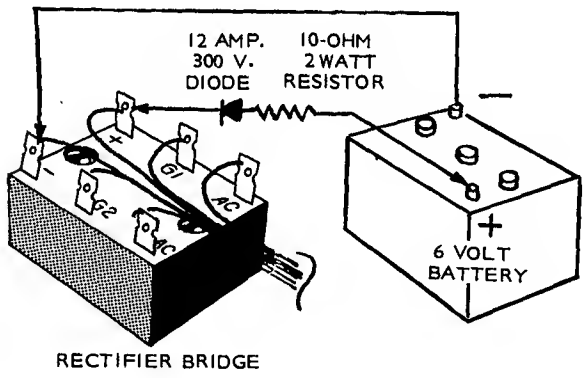

FIGURE 5. FIELD FLASHING CIRCUIT

[B]

TESTING L21 REACTOR

The L21 commutating reactor mounts inside the control box, below the VR21 Voltage Regulator.

Coils 1-2 and 3-4 are wound on the same core. Resistance between 1-2 and 3-4 should be equal. Resistance between coils (e.g. 1-4) or from any terminal to frame of the reactor should be infinity (Figure 6).

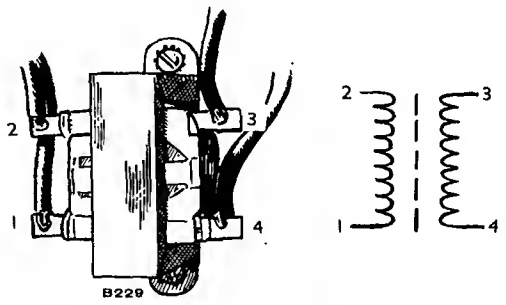

FIGURE 6. L21 REACTOR

[C]

TESTING DIODES

Six diodes labeled CR1 thru CR6 are mounted on the rotating exciter assembly as shown in Figure 7. Test diodes as follows:

1. Remove one diode at a time from heat sink. Test that diode and reinstall on heat sink before proceeding to the next one.
2. Check the resistance of the diode with an ohmmeter. Connect one lead to the top of the diode and other lead to the diode stud. Observe reading. See Figure 8.
3. Now reverse leads and again observe reading. A good diode should have a higher reading in one direction than the other. If both readings are high, or if both readings are low, diode is defective and must be replaced with a new, identical part.

CAUTION **Excessive dust or dirt on diodes and other components will cause overheating and eventual failure. Keep these assemblies clean!**

REPLACING RECTIFIERS (DIODES)

1. Unsolder leadwires from terminals.
2. Use proper size wrenches to hold the body while removing the nut.
3. Push the rectifier free of its mounting hole in the heat sink.
4. Insert new rectifier into its mounting hole in the heat sink. Using nut and washer provided, secure rectifier to heat sink.
5. Torque diodes on rotating exciter assembly to 15-lb. in. (1.7 N.m).
6. Solder leadwires to new rectifiers.

CAUTION **Use a 40 watt soldering iron. Hold a needlenose pliers between rectifier and soldering point to prevent destructive heating. Excessive heat on these components will destroy them.**

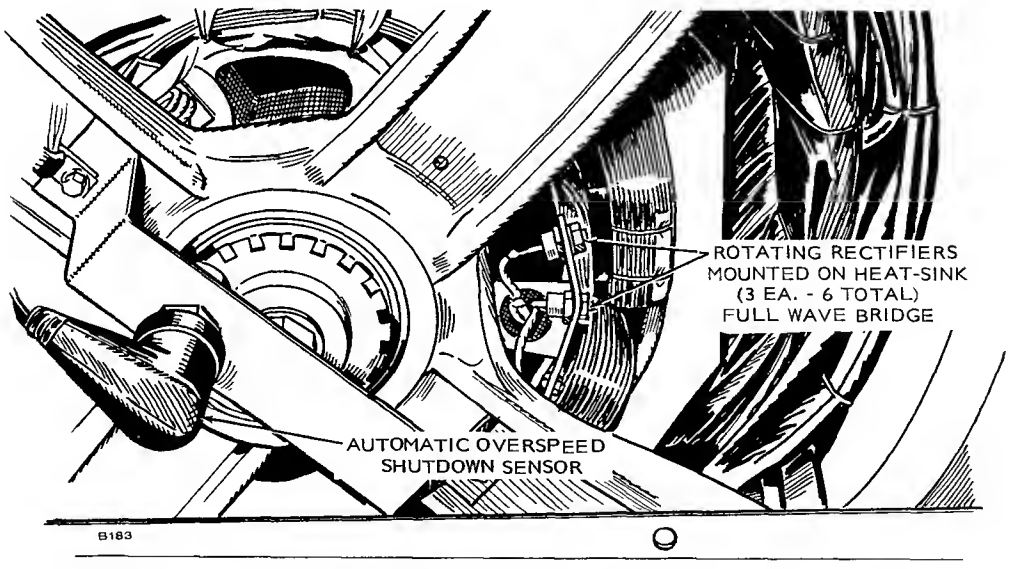

FIGURE 7. DIODE ASSEMBLY

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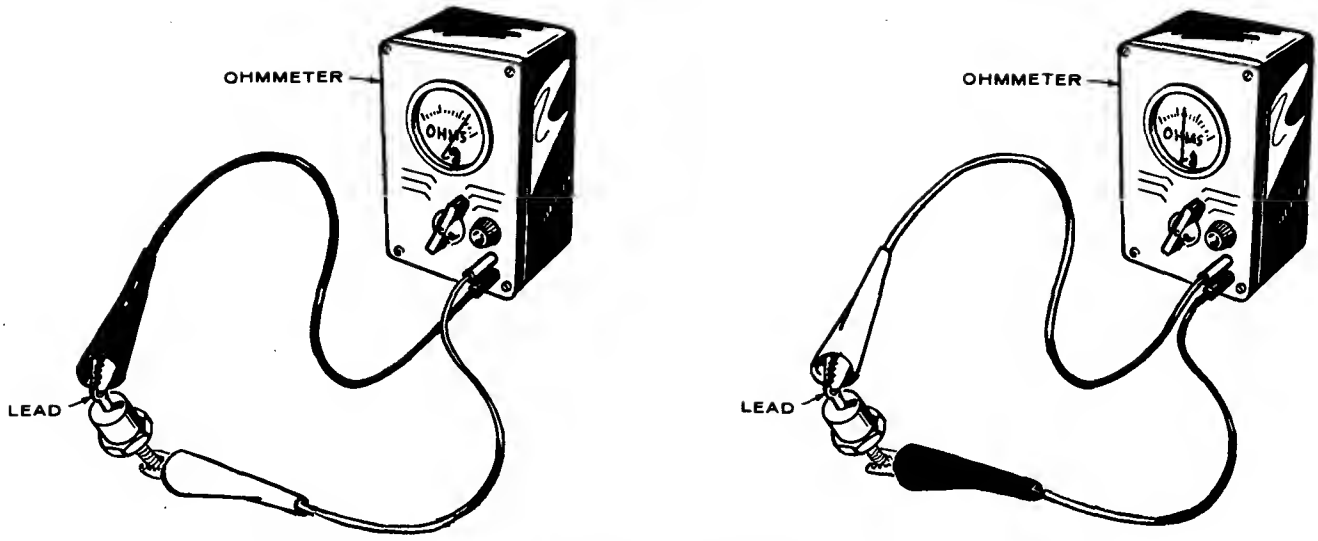


GOOD DIODE WILL HAVE HIGH RESISTANCE READING IN ONE DIRECTION AND LOW READING WHEN OHMMETER LEADS ARE REVERSED.

FIGURE 8. TESTING DIODES

[D]

TESTING SCR BRIDGE ASSEMBLY (CR21)

The SCR bridge located within the control cabinet, below the voltage regulator board, contains three diodes, CR1, CR2, and CR3, and two silicon controlled rectifiers, CR4 and CR5. These diodes and SCR's are encapsulated within an hermetically sealed box, therefore failure of any diode or SCR means the entire unit has to be replaced. See Figure 9.

Disconnect wires from SCR bridge unit prior to testing. Test unit in order shown in Table 3. Refer to Figure 10 for CR4 and CR5 test circuit. When test is complete and satisfactory, reconnect unit observing correct wiring hook-up.

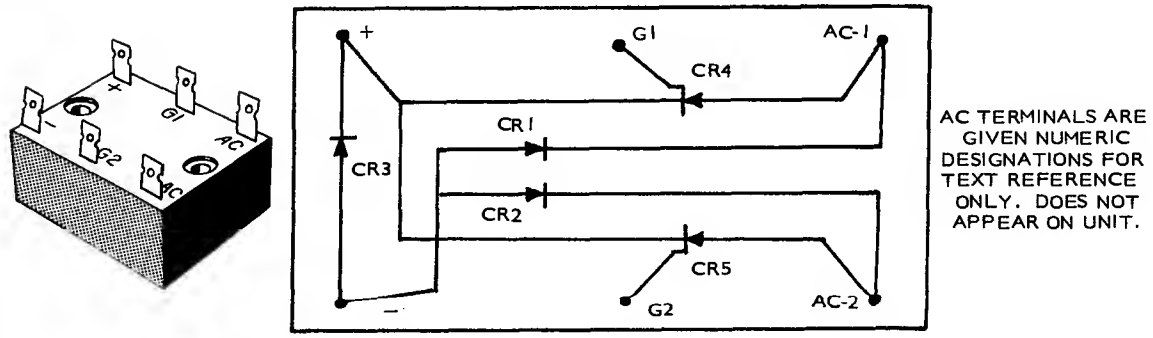


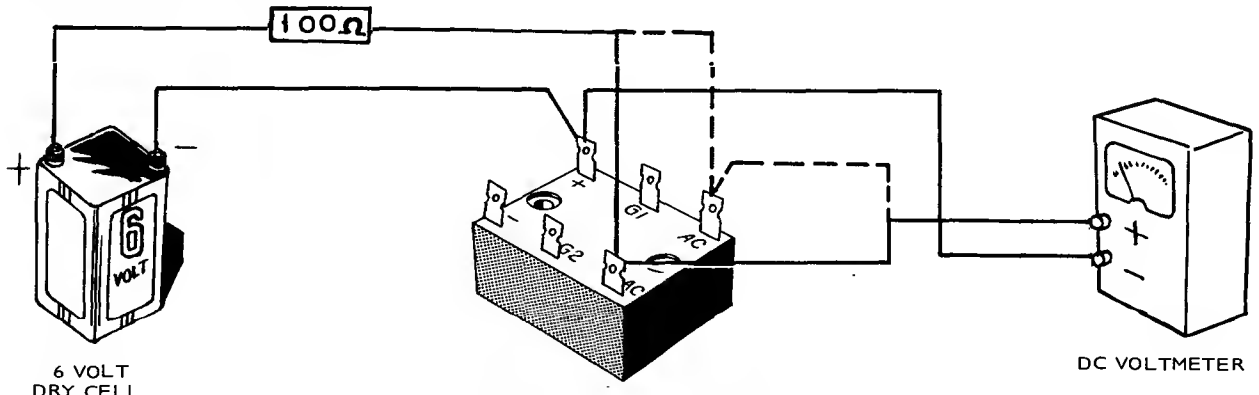
FIGURE 9. SCR BRIDGE ASSEMBLY

TABLE 3. TESTING SCR ASSEMBLY CR21

TEST	OHMMETER LEAD +	OHMMETER LEAD -	RECTIFIER TERMINALS	TESTING CR	TESTING SCR	REMARKS	METER SCALE
1	X		+	CR3		Infinity	RX10K
		X	-				
2	X		-	CR3		6- to 50-Ohms	R X 1
		X	+				
3	X		+		CR4	Infinity	RX10K
		X	AC1				
4	X		AC1			Infinity	RX10K
		X	-				
5	X		-	CR1		6- to 50-Ohms	RX1
		X	AC1				
6	X		+		CR5	Infinity	RX10K
		X	AC2				
7	X		AC2			Infinity	RX10K
		X	-	CR2			
8	X		-	CR2		6- to 50-Ohms	R X 1
		X	AC2				
	6 V Battery with Resistor +	**-**				**DC Voltmeter lead +**	**-**	**DC Voltmeter Reading** less than
9*	AC1	+			CR4	AC1	+	3 Volts
10**	AC2	+			CR5	AC2	+	3 Volts

* Apply temporary jumper from AC1 to G1 to test CR4. Remove jumper, read voltmeter. See Figure 10.

** Apply temporary jumper from AC2 to G2 to test CR4. Remove jumper, read voltmeter. See Figure 10.



6 VOLT DRY CELL BATTERY

DC VOLTMETER

FIGURE 10. TESTING SCR

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[E]

TESTING GENERATOR ROTOR

Testing for grounds: Remove F+ and F- rotor leads from diode heat sink assemblies. Connect an ohmmeter (R x 100 Scale) between either rotor lead and the rotor shaft. A reading of less than infinity indicates a ground. See Figure 11.

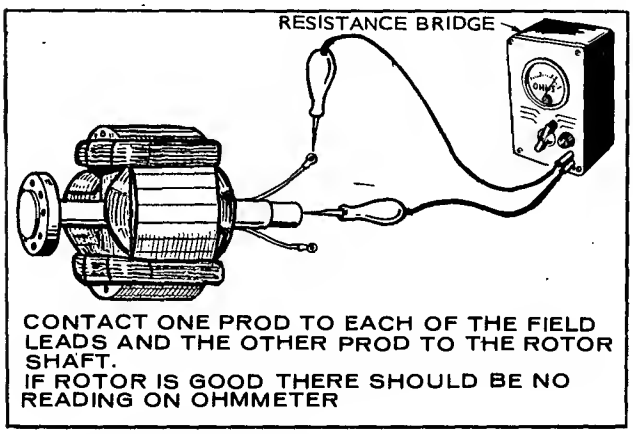

FIGURE 11. TESTING ROTOR FOR GROUNDS

Testing winding resistances: Use a Wheatstone or Kelvin bridge for this test. Remove F+ and F- rotor leads from diode heat sink assembly. Connect meter leads between F+ and F-. Resistances should be within the values specified in Table 4 at 68° F (20° C). See Figure 12.

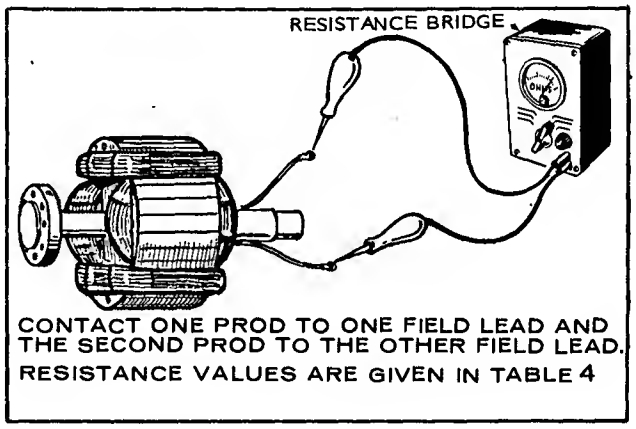

FIGURE 12. MEASURING ROTOR WINDING RESISTANCE

TABLE 4. ROTOR RESISTANCES

kW RATING AND SERIES		RESISTANCE
50 Hz	60 Hz	OHMS
165.0 DYH	200.0DYH	1.67 to 2.05
165.0 DFP	200.0 DFP	1.67 to 2.05
192.0 DFP	230.0 DFP	1.80 to 2.20
208.0 DYB	250.0 DYB	1.91 to 2.33
208.0 DFM	250.0 DYB	1.91 to 2.33
208.0 FT	250.0 FT	1.91 to 2.33
250.0 DFS	300.0 DFS	2.17 to 2.35
250.0 DFT	300.0 DFT	2.17 to 2.35
250.0 DHA	300.0 DHA	2.17 to 2.35
290.0 DFN	350.0 DFN	2.38 to 2.90
290.0 DFU	350.0 DFU	2.38 to 2.90
290.0 DHB	350.0 DHB	2.38 to 2.90
290.0 WF	350.0 WF	2.38 to 2.90

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[F]

TESTING GENERATOR STATOR

Testing for grounds: Before testing stator, disconnect control wires 4, 7, 8, 9 and 10 from TB21, isolate from each other and ground. Connect all stator output leads (T1-T12) together. Use an ohmmeter set on the R x 100 scale and measure the insulation resistance between these windings and the stator frame. A reading of less than infinity indicates a ground.

Testing for shorts: Connect an ohmmeter (R x 100 scale) between each individual winding and the other windings connected together. Repeat until all six coils have been tested. A reading of less than infinity indicates a short.

Measure resistance of windings using a Wheatstone or Kelvin bridge meter. See Figure 13. If any windings are shorted, open or grounded, replace the stator assembly. Before replacing the assembly, check the leads for broken wires or damaged insulation.

Stator output leads T4, T7, T8, T9 and T10 are interconnected (within the stator) to five stranded (#10 aircraft) control wires. These wires are labeled 4, 7, 8, 9 and 10 respectively and terminate at TB21 (terminals 61-65).

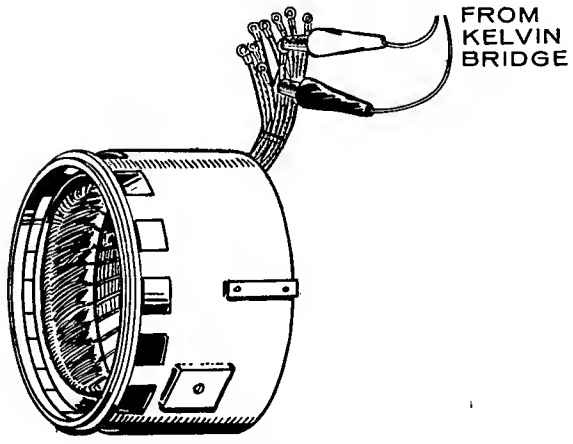

FIGURE 13. TESTING STATOR WINDINGS

TABLE 5. RESISTANCE VALUES FOR STATORS

All resistances should be within the value shown at 68° F (20° C). Use a Wheatstone or Kelvin bridge for this test. Measure between the following leads:

T1-T4	T7-T10	T3-T6
T9-T12	T2-T5	T8-T11

KW RATING		RESISTANCE
50 Hz	60 Hz	Ohms
165	200	.0047 to .0057
208	250	.0032 to .004
250	300	.0022 to .0027
290	350	.0018 to .0022

[G]

TESTING EXCITER ROTOR (ARMATURE)

Testing for grounds: Remove diodes CR1, CR2, CR3, CR4, CR5, and CR6 from diode heat sink assemblies. Using an ohmmeter (R x 100 scale) measure insulation resistance between any of the leads and the laminations (exclude the diodes from the test circuit). A reading of less than infinity indicates a ground.

Testing winding resistance: Using a Wheatstone or Kelvin bridge meter, measure resistance between leads pairs T1-T2, T2-T3 and T1-T3. Resistance should be 0.496-0.607 ohms at 20° C (68° F). See Figure 14.

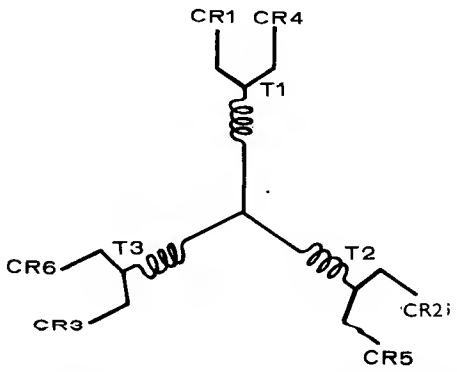

FIGURE 14. TESTING EXCITER ARMATURE

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[H]

TESTING EXCITER STATOR

Testing for grounds: Using an ohmmeter (R x 100 scale), measure the insulation resistance between either lead F1 or F2 and the laminations. A reading of less than infinity indicates a ground. See Figure 15.

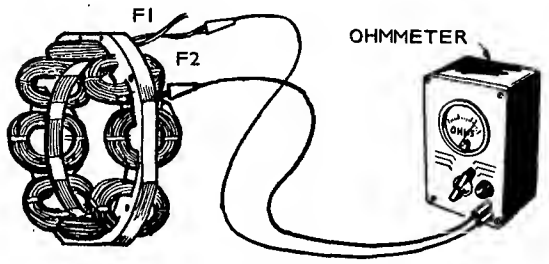


FIGURE 15. TESTING FOR GROUNDS

Testing winding resistance: Measure coil resistance between leads F1 and F2 with an ohmmeter (scale R x 1). Resistance should be 15.55 to 17.79 ohms at 68° F (20° C). See Figure 15A.

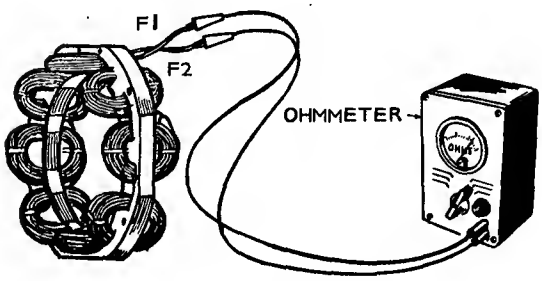
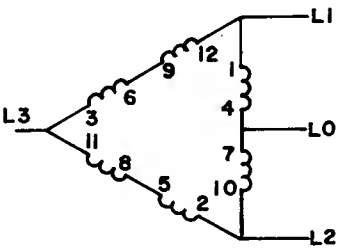
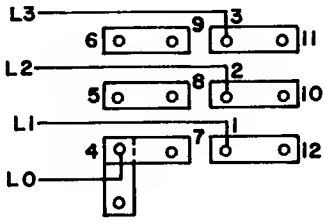
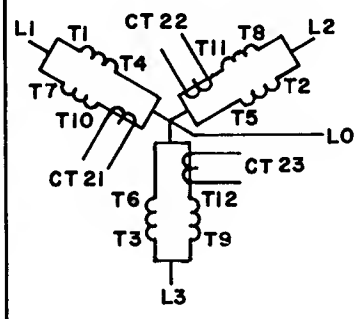
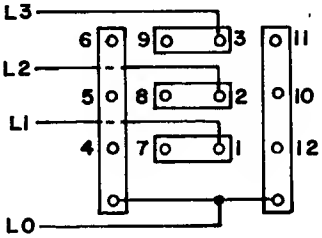
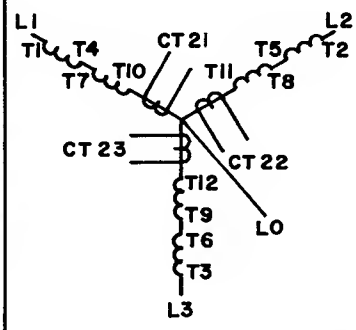
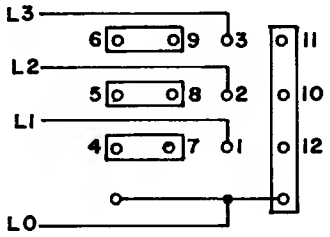
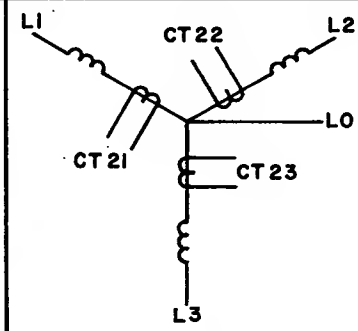
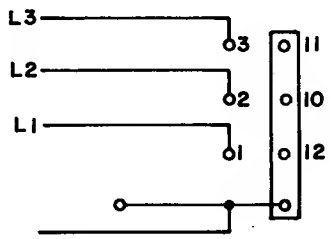


FIGURE 15A. MEASURING FIELD RESISTANCE

[I]

RECONNECTION

Figure 16 shows reconnection possibilities for the YB series generators. When reconnecting bus-bars for a different voltage, be sure to reconnect lead from terminal 63 (inside control box) to either H3, H4 or H5. See Figure 2 and 16.

NAMEPLATE VOLTAGE CODE	VOLTAGE	PHASE	FREQUENCY	CONNECT LEADS FROM TERMINAL 63 TO:	GENERATOR CONNECTION	GENERATOR CONNECTION SCHEMATIC DIAGRAM	GENERATOR CONNECTION WIRING DIAGRAM
5D	120/240	3	60	H5	SERIES DELTA		
6D	240/480	3	60	H5			
	120/208	3	60	H3	PARALLEL WYE		
17	127/220	3	60	H4			
	139/240	3	60	H5			
	110/190	3	50	H3			
517	115/200	3	50	H4			
	120/208	3	50	H4			
	127/220	3	50	H5			
7	220/380	3	60	H3	SERIES WYE		
	240/416	3	60	H3			
17	254/440	3	60	H4			
	277/480	3	60	H5			
	220/380	3	50	H3			
517	230/400	3	50	H4			
	240/416	3	50	H4			
	254/440	3	50	H5			
9X	347/600	3	60	H5	SERIES WYE		

SINGLE PHASE NOTE NOT AVAILABLE

YB SERIES GENERATORS 98-2579(C) Rev. 7-75

FIGURE 16. OPTIONAL VOLTAGE CONNECTIONS

[J]

SENSITIVITY REFERENCE CIRCUIT

YB Series regulators can be set to either a frequency sensitive or non-frequency sensitive reference. Frequency sensitive reference means the output voltage of the generator set will decrease in proportion to the frequency (prime mover speed). This decrease in output voltage will reduce the load on the prime mover, permitting it to return to rated voltage and frequency when an overload is removed. Non-frequency sensitive reference could cause the prime mover to reduce speed due to a temporary overload, then would require a further 50 percent to 60 percent load reduction to allow it to return to rated speed. This reference change is accomplished by soldering wire W1 to terminal E1 for frequency sensitivity or to terminal E2 for non-frequency sensitivity. See Figure 17.

Unless requested otherwise by purchaser, ONAN generator sets are connected at the factory to a frequency sensitive reference.

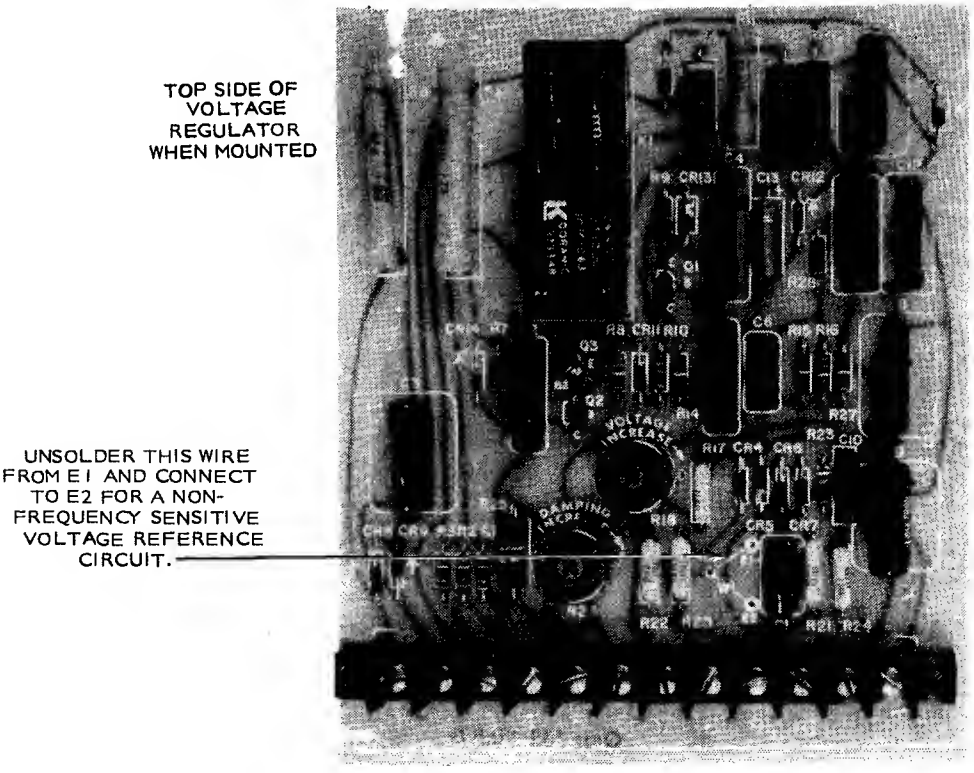


FIGURE 17. VR21 PRINTED CIRCUIT BOARD

[K]

VOLTAGE REGULATOR ADJUSTMENT

If VR21 voltage regulator printed circuit board has been replaced, it may be necessary to center the voltage adjust rheostat (R21) on meter panel.

1. Center the voltage adjust knob so pointer is in a vertical position.
2. Open meter panel doors. Start unit.
3. Using a screwdriver, turn R18 potentiometer on printed circuit board VR21 in direction shown to increase or decrease the voltage. Observe voltmeter on meter panel while making adjustment. Set voltage with no load connected to generator.
   (Example: For a 120/240 volt connection, set no load voltage at approximately 246 volts).

If voltage is unstable or tends to hunt, turn R26 potentiometer on VR21 in the direction shown on printed circuit board to increase damping sensitivity (Figure 18).

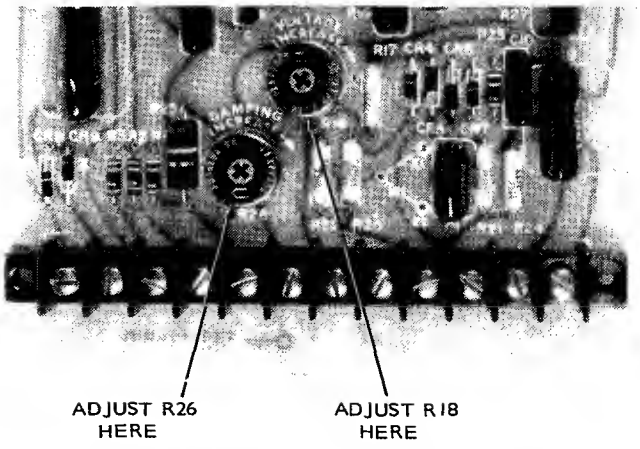


FIGURE 18. ADJUSTING VOLTAGE ON VR21

[L]

GENERATOR DISASSEMBLY

If generator testing determines that generator needs repair, remove and disassemble as follows:

1. Disconnect and remove load wires in outlet box.
2. Disconnect leadwires from control box. Check wire markings for legibility to ease assembly. Arrange leads so they can be easily withdrawn from the control box.
3. Remove generator air inlet grille and end bell cover. Disconnect and remove control box housing. Remove capscrew, washer and speed sensor wheel from rotor shaft.
4. Block the rear of the engine in place by supporting the flywheel housing. Remove capscrews securing the generator mounting bracket to the skid base. Remove the generator air outlet screen.

Step 5 applies to Models DYH and DYB only.

5. Attach an overhead hoist to the stator assembly lifting bar. Remove the capscrews securing the stator assembly to the engine flywheel housing and slide the stator back about three inches. Remove the capscrews attaching the flexible drive coupling to the engine flywheel and remove the stator assembly and rotor assembly (rotor inside the stator) from the engine.

CAUTION **Do not let rotor hang unsupported by the flexible drive coupling. Rotor weight will damage the flexible drive coupling.**

Proceed to step 8.

6. Attach an overheat hoist to the stator assembly lifting bar. Remove the capscrews securing the stator assembly to the engine flywheel housing and slide the stator assembly off the rotor assembly.
7. Attach hoist and sling to the rotor assembly and apply a slight lift to support the rotor. Remove capscrews securing the flexible drive coupling to the engine flywheel and remove the rotor from the engine.
8. Remove end bell from stator assembly; remove exciter field from end bell assembly if necessary.
9. Remove bearing and spacer from shaft.
10. Disconnect rotor field leads from rectifier assemblies F1 and F2 on exciter armature. Remove exciter armature.

GENERATOR ASSEMBLY

Generator assembly is the reverse of disassembly procedure:

1. Always replace bearing with a new one; apply a layer of Molykote grease Onan #524-0118 on end-bell bearing bore before inserting bearing.
2. Torque bearing capscrew to 60-70 lb. ft. (81.3 to 94.9 N.m).

Step 3 applies to models DYH and DYB only.

3. The rotor and stator must be assembled together by inserting the rotor into the stator before attaching to engine, thereby preventing damage to the flexible drive coupling. Rotate engine flywheel to approximately 45° BTDC. This will bring one tapped flywheel hole on top. Assemble drive disc to flywheel with corner marked "TOP" up. Proceed to assemble stator to flywheel housing.
4. Torque drive disc to rotor capscrews to 200-240 lb. ft. (271 to 325 N.m).
5. Torque drive disc to flywheel capscrews to 110 to 120 lb. ft. (149 to 162 N.m).
6. Torque end bell mounting stud nuts to 55 to 65 lb. ft. (75 to 88.0 N.m).
7. Torque stator mounting capscrews to 45 to 55 lb. ft. (61 to 75 N.m).
8. Adjust magnetic sensor air gap at .050- to .060-inch (1.27 to 1.52 mm).
9. Refer to parts catalog for replaceable parts and assemblies. Refer to applicable wiring diagram for reassembly.

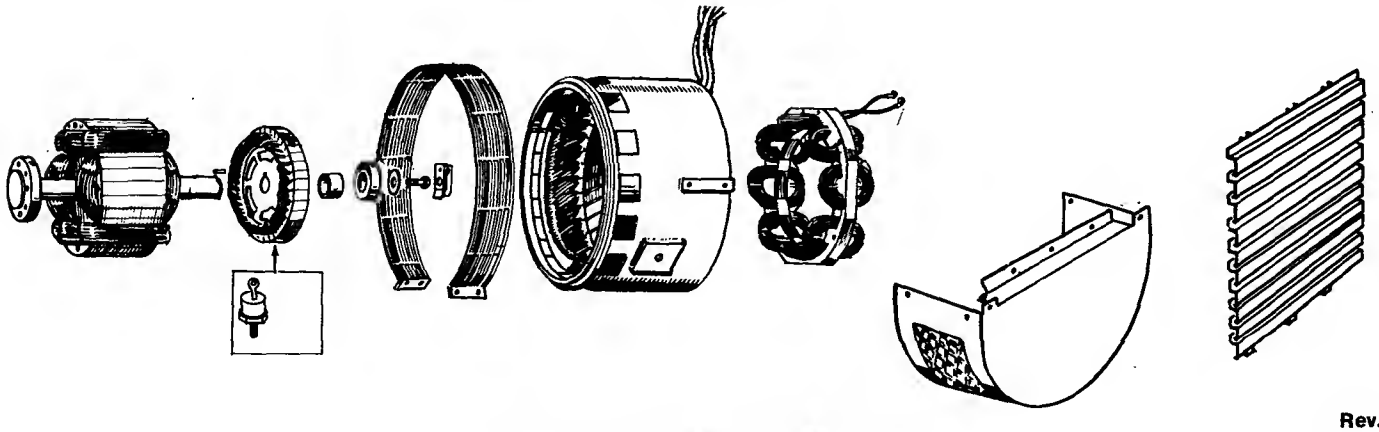


FIGURE 19. GENERATOR DISASSEMBLY

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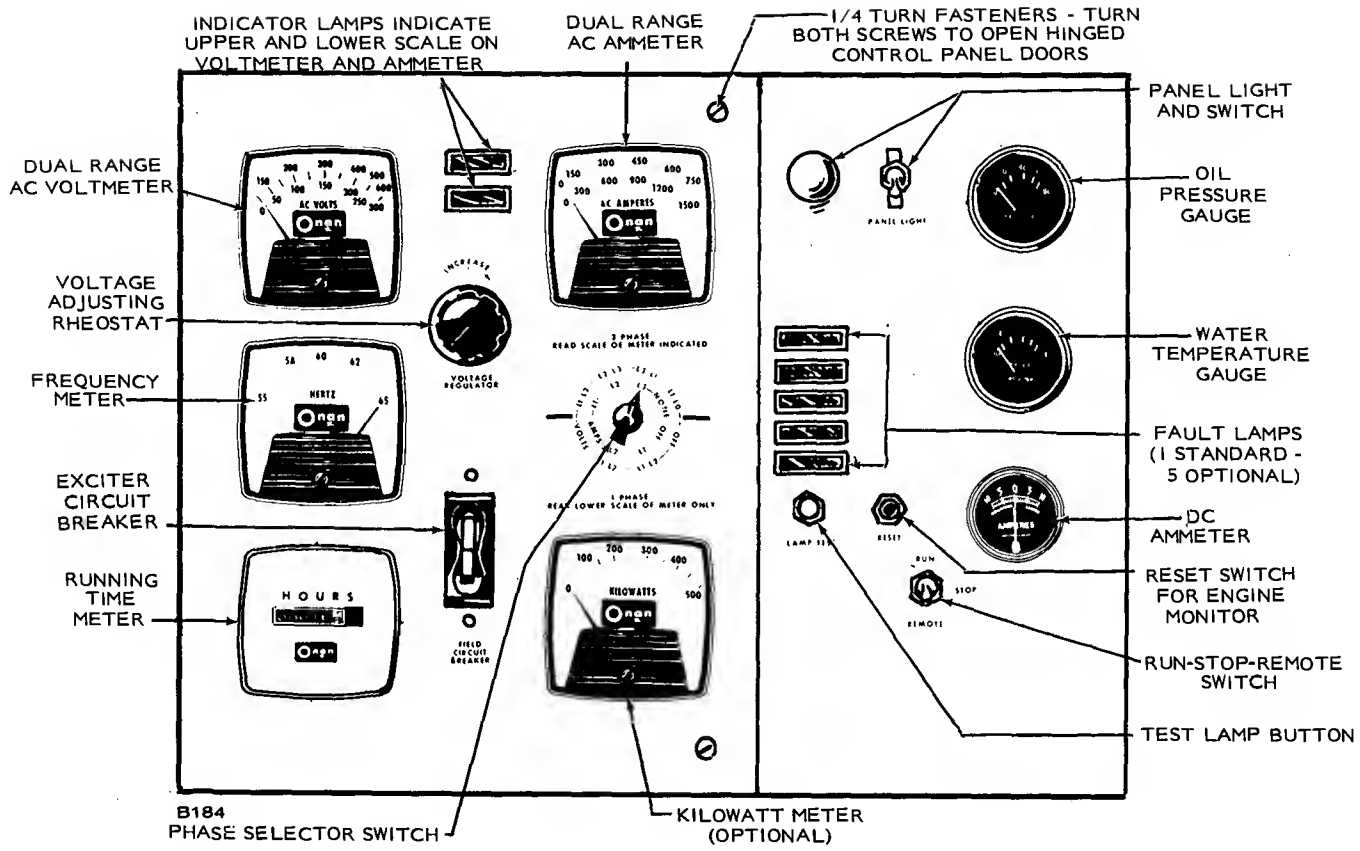

FIGURE 20. CONTROL PANEL

CONTROL SYSTEM

GENERAL

The shock-mounted control box has two doors, opening from the middle. For purposes of identifying location, left and right is considered, in this manual, when facing the control box.

The left hand door is designated the AC panel and contains the following equipment as a standard installation. See Figure 20.

1. **Dual range AC voltmeter.** Scales 50 to 300 volts and 100 to 600 volts AC.
2. **Dual range AC ammeter.** Range of meter depends upon size of generator.
3. **Voltmeter ammeter phase selector switch.** Selects the phases of the generator output to be measured by the AC voltmeter and AC ammeter, i.e., line-to-line, line-to-neutral, single phase or three phase.
4. **"Range in use" indicator lights.** Identifies high or low scale to be read on the AC ammeter or AC voltmeter.
5. **Frequency meter.** Pointer type meter indicates generator output frequency in Hertz.
6. **Running time meter.** Registers total number of hours, to one-tenth hour unit has run. Recorded time is accumulative; the meter cannot be reset to zero time.
7. **Voltage regulator.** Rheostat (R21) provides an adjustment of plus or minus 5 percent of generator output voltage.
8. **Exciter Circuit Breaker (CB21).** Provides generator exciter and regulator protection from overheating in the event of certain failure modes of the generator exciter and voltage regulator.

Optional equipment installed on the AC panel.

9. **Kilowatt meter.** Connected to a transducer mounted on the back of the control cabinet, this instrument indicates generator output in kilowatts. The transducer is connected across the phases of the generator, and to the current transformers.
10. **Governor control.** This single-pole double-throw, center-off, momentary contact switch is wired into a split-field series motor situated on top of the engine governor. Used only with a Woodward PSG Governor the switch operates the motor which adjusts the governor and therefore the engine speed.

The right hand door, designated the DC panel, contains the following equipment. See Figure 20.

1. **Oil pressure gauge.** Connected to a resistance type sender on the engine, this instrument indicates engine circulating oil pressure.
2. **Water temperature gauge.** Connected to a resistance type sender on the engine, this instrument indicates engine coolant temperature.
3. **Ammeter.** Indicates the output current of the battery charging alternator.
4. **Run-Stop-Remote switch.** Starts and stops the unit locally or from a remote location.
5. **Reset switch.** Manual reset for engine monitor after shut-down, Run-Stop-Remote switch in "Stop" position.
6. **Lamp test.** Depress to test warning lamp bulbs. Operate only while engine is running.
7. **Warning light.** Indicates "Fault in engine operation".

Optional equipment installed on the DC panel.

8. **Penn State Run-Stop/Reset-Remote switch.** Momentary contact in the depress during reset position. To reset engine monitor, hold switch in the DDR position, actuate reset switch, release and select run to start engine.
9. **Warning lights.** Eliminates the one "Fault" light and substitutes five indicator lights to give warning of:

    1. Overcrank
    2. Overspeed
    3. Low Oil Pressure
    4. High Engine Temperature
    5. Low Engine Temperature

CONTROL OPERATION

GENERAL

In emergency situations a serviceman can be faced with the problem of returning a failed generator set to service to restore vital electrical power in the minimum time (e.g., life support equipment in hospitals). The more information he has on the system the shorter is the down-time period.

This section of the manual is intended to instruct the serviceman on the operation of the relays and printed circuit modules which comprise the YB control system. Used in conjunction with the schematic diagrams at the back of the manual this information should provide the serviceman with greater understanding of the function of the system.

ENGINE CONTROL RELAYS

START DISCONNECT RELAY, K11.

When R-S-R (Run-Stop-Remote) switch is placed in the Run position, +24VDC is applied to coil terminal B of relay K11. Terminal A is connected to terminal 1 of module A17. When turned on, transistor A17-Q2 provides coil ground through A17-17 and the relay holds in. When energized, relay K11 performs the following switching actions:

1. Contacts 7 and 4 close to apply +24VDC through K14, 7-1 to Cranking module A14 to actuate K13 starter solenoid which causes the starter to turn.
2. Contacts 3 and 9 open to start the Overcrank timing sequence.
3. Contacts 8 and 2 open to allow engine starting without Low Oil Pressure shutdown.

Relay K11 will remain actuated until engine begins to run and an input of 150- to 190-Hertz is applied to A17, 21 and 22 from the magnetic speed sensor. This causes A17-Q2 to cease conducting and breaks the ground circuit to K11 coil at which time the following occurs:

1. Contacts 7 and 4 open to disconnect the +24VDC from the cranking starter circuit.
2. Contacts 3 and 9 close to terminate overcrank timer.
3. Contacts 8 and 2 close to enable Low Oil Pressure shut down circuit.

IGNITION RELAY, K12

Actuated by +24VDC, through module A11 when R-S-R switch is placed in run position. Relay A11-K1 N.C. contacts complete the circuit through module A11-20 terminal to relay K12 coil. This relay remains energized for duration of engine run.

Contacts perform the following switching actions:

1. Contacts 8 and 5 close and apply +24VDC to voltage regulator of battery charging alternator to provide excitation.
2. Contacts 4 and 7 close and apply +24VDC to —
   a. Oil pressure gauge.
   b. Water temperature gauge.
   c. Water solenoid valve.
   d. Fuel pump.
   e. Energize K15, stop relay (not diesel).
   f. K11-7, input to module A14.
   g. K15(-6) to energize fuel solenoid valve (not diesel).
3. Contacts 3 and 9 open to initiate Cycle Cranker sequence.

Deactivation of relay K12 will shut down the engine.

START SOLENOID, K13

Energized by closure of K11 (7-4) through K14 (7-1) and Cranking module A14. One set of contacts only, N.O. When relay actuated, it applies +24VDC through circuit breaker B1 (on engine) to starter shift solenoid (K). When engine starts, relay contacts K11 (7-4), followed by K14 (7-1) open to deactuate K13 solenoid.

STARTER PROTECTION RELAY, K14

Energized by output of generator (190-240VAC), drops out when voltage falls to 135 VAC. When actuated contacts switch as follows:

1. Contacts K14 (9-6) close to apply +24VDC to TB11-58 then to remote station to light a "Generator on" light.
2. Contacts K14 (7-1) open to de-energize K13; act as a backup for relay K11 (7-4).

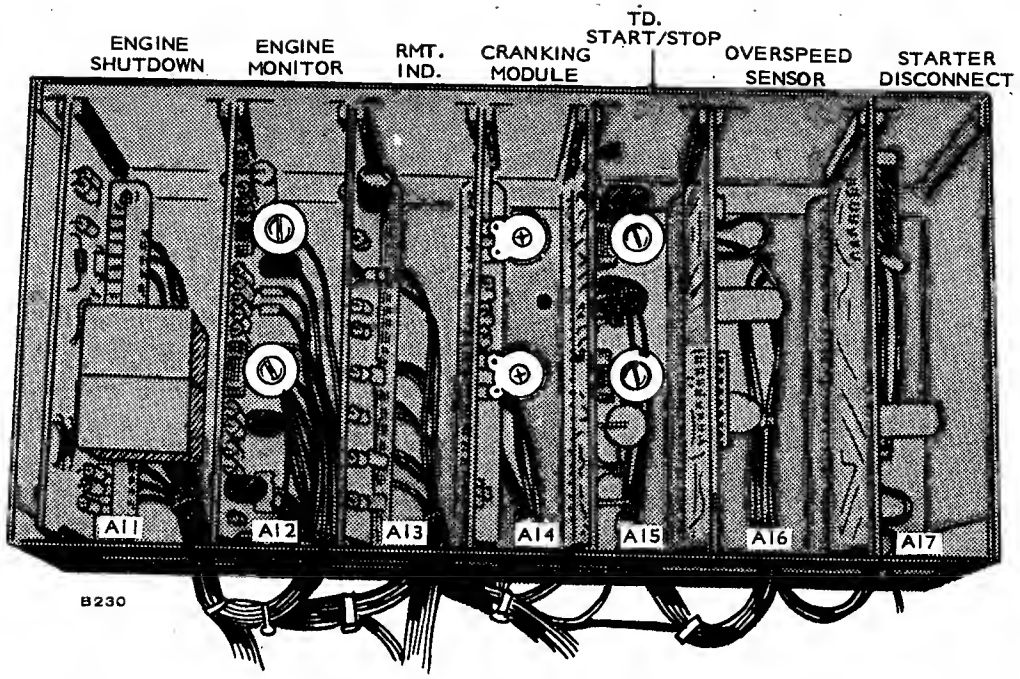

FIGURE 21. ENGINE CONTROL MODULE LOCATION

STOP RELAY, K15 (NATURAL GAS)

Energized by closure of K12 (4-7) contacts. Contact switching is as follows:

1. Contacts 7-1 and 5-2 open and remove grounds from magneto (or magnetron) primary coils.
2. Contacts 3-9 open and disconnect K1 fuel solenoid from AUX output of battery charging alternator.
3. Contacts 6-9 close and apply +24VDC to K1 fuel solenoid.

OVERSPEED RELAY K15 (DHA AND DHB ONLY)

Normally deenergized, is used as a back-up to the standard Overspeed installation. When, in the event of engine overspeed transistor A16-Q2 conducts, a ground is supplied to terminal 13 of A11 Engine Shutdown module. This causes A11-Q1 to conduct and apply 24VDC to energize K15 relay.

Closure of K15 contacts 6 and 9 applies 24VDC to K4 Air Inlet solenoid which actuates air shutters to starve the engine and induce shutdown.

Should this back-up system be actuated, manually reset air shutter doors. The engine will not start until shutters are open.

ENGINE CONTROL MODULES

ENGINE CONTROL MODULE, A11

The R-S-R switch in Run position applies +24VDC to A11-5, through N.C. contacts of A11-K1 then out of pin 20 to energize K12 ignition relay. The same +24VDC leaves the board at pin 14, goes through lamp test switch (S13) then reenters at pin 18 where it is applied to the coils of A11-K1 and A11-K2. A ground at A11-7 will actuate A11-K1 which will perform the following function:

1. N.C. contacts open to remove +24VDC from K12 coil. This will shut down the engine.
2. N.O. contacts close and apply +24VDC (from the alarm reset switch) to the alarm terminal on TB12.

A ground on A11-3 will actuate A11-K2 which will function as follows:

1. N.O. contacts close to actuate alarm and apply +24VDC through A11-19 to A12-1 to keep fault lamp lit.
2. N.O. contacts close; if a ground is present on A11-1, relay A11-K1 will actuate and initiate engine shutdown. The ground on A11-1 will act as a hold-in circuit for A11-K1 coil.

DHA and DHB only: In the event of engine Overspeed Shutdown a ground is applied to terminal 13. The resultant current flow across resistor A11-R1 will cause A11-Q1 transistor to turn ON and apply 24 VDC through terminal 9 to actuate relay K15.

Engine shutdown caused by malfunction will leave A11-K1 relay latched. Reset relay as follows:

1. Reset, Standard Installation. Place R-S-R switch in Stop position; depress reset button. Return R-S-R switch to required operational position (i.e., Run or Remote).
2. Reset, Penn State Installation. Place and hold Run-Remote-Reset switch in "Depress During Reset" position. Press reset button. Release switch and return to the required operational position.

ENGINE MONITOR MODULE, A12

R-S-R switch in Run position feeds +24VDC through A11 (pins 5 and 20) to terminal A12-20. The same +24VDC is connected to DS12-Overcrank, DS13-Overspeed and DS14-Low Oil Pressure Lights. Grounds for the fault lights are provided within the Engine Monitor module.

Start Disconnect relay K11, N.C. contacts 9-3 (open when K11 energized) are connected between A12-22 and ground. If after 75-seconds of cranking engine does not start, a potential built up on capacitor A12-C1 will discharge and cause unijunction A12-Q2 to fire. Unijunction A12-Q3 fires and turns ON A12-CR3, to apply a ground to A11-K1 relay, which energizes and stops any further starting action. A12-CR3 will also provide a ground for the Overcrank light to indicate a fault.

Engine start within 75-seconds will cause a signal from the overspeed sensor through module A16 to turn OFF transistor A17-Q2 and drop out relay K11. N.C. contacts 9-3 close and short out capacitor A12-C1 to prevent engine shutdown through Overcrank function.

With the engine running and relay K11 de-energized, low engine oil pressure will cause LOP switch to close applying a ground to pin 4. Transistor A12-Q4 will turn off, A12-CR6 will turn on and apply a ground for Low Oil Pressure light to indicate a fault. A11-K1 will cause K12 relay to shutdown the engine and set off the alarm system.

In the event of generator overspeed (i.e. rpm in excess of 2010), the output of A16-IC2 on module A16 turns on A16-Q2 which conducts and applies a ground to A12-2. This will turn on A12-08, A12-CR8 will conduct and provide a ground for the Overspeed light to indicate a fault. A11-K1 will energize to shut off K12 relay to stop the engine. The alarm will operate.

REMOTE INDICATOR MODULE, A13.

This module is used on five Fault light systems only, to light fault indicators at remote stations.

As an example, in the event of a low oil pressure shutdown a ground will be applied to A12-5. This same ground will appear at A13-1 to turn on A13-Q1 and apply +24VDC to A11-2 to light the Low Oil Pressure fault indicator at the remote station. Two extra fault lights are connected into the A13 module. DS15 High Engine Temperature and DS16 Low Engine Temperature Closure of High Engine Temperature Sensing switch applies a ground to A13-20. This starts A13-Q6 conducting which turns on CR7 to ground pin 14, and light the High Engine Temperature lamp and apply a ground to A11-K2 for the alarm system. A13-Q5 will conduct and apply +24VDC to A13-12 for the remote station light.

Closure of the Low Engine Temperature Sensing switch will apply a ground to A13-8, A13-Q4 will conduct, set-panel and remote Low Engine Temperature lights will indicate a fault. There is no alarm or engine shutdown with this fault.

CYCLE CRANKER MODULE, A14.

Available as an option the Cycle Cranker allows three crank cycles and two rest cycles of the engine starter motor, within the 75-second cranking period established by module A12.

Cycle times are adjustable. Crank cycle time is varied by A14-R4, Rest time by A14-R6. Crank time is 13- to 17-seconds, Rest time is 8- to 12-seconds. The rheostats are accessible through holes in the module plate.

When the R-S-R switch is placed in the Run position, K11 is actuated, K11 (7-4) contacts close and +24VDC is applied to terminals 3, 4 and 5 of A14. Transistor A14-Q2 turns on and causes Q3, Q4 and A5 to conduct and apply +24VDC to K13 starter relay. Capacitor A14-C2 charges and turns off A12-Q2 by turning on Q1 and allows Q3, Q4, and Q5 to turn off and de-activate K13. Capacitor A14-C2 discharges, transistor Q2 turns on and the cranking cycle is repeated until capacitor A12-C1 is charged, A12-CR3 turns on allowing relay A11-K1 to pull-in to de-activate ignition relay K12 and prevent any further cranking action.

If the engine starts within the cranking cycle time (75-seconds) relay K11 will de-energize, contacts K11 (3-9) will close and capacitor A12-C1 will be discharged setting its voltage to zero.

STANDARD CRANKER MODULE, A14A.

This module allows +24VDC to be applied to K13 Starter relay and cranking to continue until the engine starts and relay K11 is de-energized as above, within the 75-second cranking period established by module A12.

TIME DELAY START-STOP, A15.

Used only with a remote control station, this module inserts a timed delay into the Start and Stop functions. Delay times are adjustable: Start, up to 15-seconds and Stop, from 30-seconds to 5 minutes. Adjustments can be made through access holes in the module plate.

When engine start signal is initiated from a remote station, the set control panel R-S-R switch is left in 'Remote' position. Initiation of a Start signal will apply +24VDC to terminals A15-17 and A15-9. Voltage at A15-17 allows capacitor A15-C3 to charge, voltage at A15-9 prevents capacitor A15-C4 from charging. Charge time of A15-C3 is adjusted by rheostat A15-R14. Capacitor A15-C3 when charged will turn on A15-Q1 which will cause A15-CR1 to conduct and apply +24VDC to the output terminals of the module, then to distribution points in the control panel. Once the gate of A15-CR1 has been triggered, the device will continue to conduct.

Initiation of a Stop signal is really removal of the Start signal, which removed +24VDC from terminals 17 and 9 to allow capacitor A15-C4 to charge. Charge rate is adjusted by rheostat A15-R16. When A15-C4 has charged, transistor A15-Q8 will turn ON and cause the potential across capacitor A15-C6 to go more positive and bias the cathode of A15-CR1 to turn it OFF. This in turn will shut down the set.

TIME DELAY BYPASS MODULE, A15A.

Use of this module allows Start/Stop control from a remote station without the time delay advantage.

Engines fitted with turbo super chargers should be run for at least five minutes after load removal before shutdown. This allows engine temperature to stabilize and the turbo housing to cool off and prevent warping or cracking of the turbo assembly.

Control panels with the time delay will allow the set to run for five minutes before automatic shutdown.

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OVERSPEED SENSOR MODULE, A16.

The Overspeed sensor system should be considered in two sections.

1. A 20-tooth disc mounted on the generator shaft and a magnetic pick up.
2. Overspeed sensor control printed circuit module.

The output of the disc pickup device is fed into the sensor module and is used for two purposes.

1. Engine shutdown when speed reaches 2010 rpm.
2. Disconnects starter when engine speed reaches 450 to 570 rpm and reconnects starter at 10 to 30-rpm.

The 20 tooth disc rotates at engine speed and is positioned so that the teeth are in the field of the magnetic pick-up. Rotation of the disc induces a voltage in the pickup which is fed into a switching amplifier in A16-IC2, then into a multivibrator (A16-IC1) where a voltage is produced which is proportional to the input frequency. At transistor A16-Q1 the same amplifier output is supplied to A17- Starter Disconnect module.

In the event of generator overspeed, the output of the frequency-to-voltage converter (A16-IC1) switches a zener diode into the base of A16-Q2 to turn ON and provide a ground for the Overspeed fault light, alarm and engine shutdown if the engine speed reaches 2010 rpm.

DHA and DHB only: An additional function when A16-Q2 turns ON is application of a ground to terminal 13 of A11 Engine Shutdown module for air shutter operation.

START DISCONNECT MODULE, A17.

This module is responsible for disconnecting the cranking starter at an engine speed of 450- to 570-rpm to protect the starter and the engine flywheel. A 5V square wave is fed into pins 21 and 22 from the Overspeed Sensor board, then into an integrated circuit A17-IC1. A difference in time constant circuitry effectively divides A17-IC1 into two sections, one for disconnect and one for reconnect. A square wave output from A17-IC1 is fed into A17-IC2 (essentially a flip-flop circuit) from where it becomes +5VDC which is applied to an amplifier in A17-IC3 and amplified to 13V. This voltage is then connected through a zener diode to the base of transistor A17-Q2 to turn that device ON and provide a ground to energize Start/Disconnect relay K11.

Division of A17-IC1 allows a second square wave output to be applied to another amplifier in A17-IC3 from where it connects to a filter network, then into a Nand gate of A17-IC2. At an engine speed of 450- to 570- rpm (150- to 190- Hertz) the voltage output of A17-IC2 is switched to zero which causes A17-Q2 to turn OFF and disconnect the ground from K11. De-activation of K11 will open Starter solenoid K13 and prevent the starter motor operating.

A characteristic of the Starter Disconnect circuit is that A17-IC2 will not reverse output polarity until the input is reduced to less than 10-Hertz, therefore the starter motor will not be reconnected until the engine rpm drops below 30.

FAULT LIGHTS

For a list of the fault light options, refer to Table 6. On a standard single light installation a fault indication will be accompanied by an engine shutdown and an alarm. Pennsylvania State installations will not shut down the engine for low oil pressure or high engine temperature, otherwise the installations are the same.

With four faults lighting one lamp, troubleshooting without an Engine Tester board is a process of elimination, to first of all find which fault actually caused the indication, before that fault can be rectified.

TABLE 6. FAULT LAMP OPTIONS

SYSTEM	FAULT	FAULT LAMP	STOP ENGINE	EXTERNAL ALARM	PRE-ALARM
STANDARD SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	x	x	
	High Engine Temperature	x	x	x	
PENN STATE SINGLE LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x		x	
	High Engine Temperature	x		x	
5 LIGHT	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	x	x	
	High Engine Temperature	x	x	x	
	Low Engine Temperature	x			
5 LIGHT PRE-ALARM	Overcrank	x	x	x	
	Overspeed	x	x	x	
	Low Oil Pressure	x	*	x	x
	High Engine Temperature	x	*	x	x
	Low Engine Temperature	x			

* - With additional optional sensors.

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1. OVERCRANK

If after cranking for 75 seconds the engine will not start, capacitor A12-C1 on the Engine Monitor module will charge to turn on A12-CR1, illuminate the fault light and apply a ground to pin 7 on A-11 Engine Shutdown module. This energizes A12-K1 which allows K12 to drop out and stop cranking action.

In the event an engine has been running and shuts down for a malfunction, the starter will energize (when engine rpm drops below 30) and attempt to restart the engine. After 75-seconds of cranking, the above shutdown sequence will be initiated and the cranking circuitry will be disabled.

2. OVERSPEED

Engine speed in excess of 2010 rpm will cause transistor A16-Q2 on the Overspeed Sensor module to conduct and apply a ground to pin 2 of A12 Engine Monitor module. A12-Q8 will then turn on and trigger A12-CR8 to illuminate the fault light and initiate shutdown and alarm from A11 shutdown module.

3. LOW OIL PRESSURE AND HIGH ENGINE TEMPERATURE (1-FAULT LIGHT SYSTEM)

These two controls, although performing dissimilar functions have the same result. Closure of either of these two switches connected in parallel will apply a ground to pin 4 of the A12 module. Transistor A12-Q4 will turn on causing unijunction A12-Q7 to fire and trigger A12-CR6. The fault light will illuminate. On a standard installation the alarm and engine shutdown will be initiated, but a Penn State will set off the alarm only.

FIVE LIGHT SYSTEM

On a five fault light system, High Engine Temperature switch connects to module A13-20, Low Oil Pressure switch to A12-4.

Closure of High Engine Temperature switch will apply a ground to A13-20 which will turn on A13-Q6 triggering A13-CR7, causing that device to conduct. This provides a ground path for High Engine Temperature fault light and to relay A11-K2 for engine shutdown.

Closure of the Low Oil Pressure switch has the same effect as that given for the single light system. An adjustable rheostat (A12-R11) provides a timed-delay period up to 10 seconds to allow the engine to start and oil pressure to buildup thereby preventing immediate shutdown caused by false low oil pressure.

An adjustable rheostat (A12-R11) provides a timed-delay period up to 10 seconds to allow the engine to start and oil pressure to buildup thereby preventing immediate shutdown caused by a false low oil pressure.

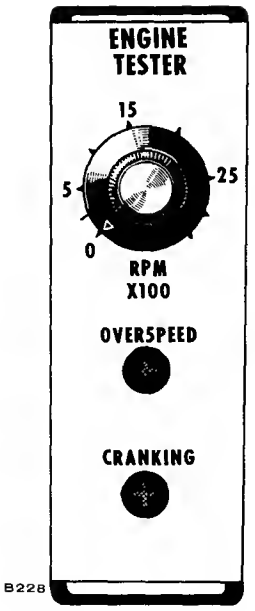

FIGURE 22. ENGINE CONTROL TESTER

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ENGINE CONTROL SYSTEM CHECKOUT PROCEDURE

This checkout procedure of the Engine Control System is for use with the Engine Control Tester module. Designed to enable the serviceman to check out the complete system, the Engine Control Tester module is an indispensable tool for rapid location of faults, or final pre-start system test.

Proceed with the checkout as follows:

1. Remove front cover of engine module rack.
2. Remove Cycle Cranker module A14. See Figure 21.
3. Insert Engine Control Tester module into A14 position.
4. Set rheostat on Tester module fully counterclockwise.

Engine will not start with controls in this configuration.

5. Place R-S-R switch in Run position, depress Lamp Test switch to test fault lamps. Proceed to checkout.

	CHECKOUT	YES	NO
1.	Does Tester Cranking light go ON?	6	2
2.	Turn Tester rheostat to 2300 rpm. Does Overspeed or Fault light illuminate on both tester and panel?	3	4
3.	Replace Start-Disconnect Module A17. Return to item 1.	—	—
4.	Does Overspeed or Fault light illuminate on Tester only?	5	Reset
5.	Replace Engine Shutdown Module A11. Return to item 1.	—	—
6.	In 65- to 85- seconds does panel Overcrank or Fault light illuminate? Does Tester light go "OFF"?	8 —	— 7
7.	Replace Engine Monitor Module A12. Return to item 1.	—	—
8.	Place Run-Stop-Remote Switch to stop and depress reset switch. Does Overcrank or Fault light go "OFF"?	10	9
9.	Check reset switch.	—	—
10.	Place Run-Stop-Remote switch in Run position. Turn Tester rheostat to 650-rpm. Does Tester cranking light go "OFF"?	14	11
11.	Turn Tester rheostat to 2300-rpm. Does Overspeed or Fault light come "ON"?	13	12
12.	Replace Generator Overspeed Sensor Module A16. Return to item 10.	—	—
13.	Replace Starter Disconnect Module A17. Return to item 1.	—	—
14.	In 10- to 20- seconds, does Low Oil Pressure or Fault light come ON?	16	15
15.	Replace Engine Monitor Module A12. Return to item 8.	—	—
16.	Reset. Continue to item 17.	—	—

	CHECKOUT (Continued)	YES	NO
17.	Turn Tester rheostat to 2300-rpm. Does Tester Overspeed light come ON? Does panel Overspeed or Fault light come ON?	 20 20	 18 19
18.	Replace Overspeed Circuit Module A16. Return to item 16.	—	—
19.	Replace Engine Monitor Module A12. Return to item 16.	—	—
20.	Turn Tester Rheostat to 400-rpm.	—	—
21.	Reset.	—	—
22.	Slowly turn Tester rheostat knob counterclockwise. Does Overcrank or Fault light come ON below 30 rpm?	 24	 23
23.	Replace Starter Disconnect Module A17. Return to item 10.	—	—
24.	Ground terminal 31 on TB11. Does High Engine Temp. or Fault light go ON? Remove ground. **Tester cranking light should go OFF if in the shutdown mode, but will remain ON if in Pre-Alarm mode.**	 26	 25
25.	Replace Remote Indicator Module A13. Return to item 21.	—	—
26.	Place panel Run-Stop-Remote switch to Remote position. Rotate Tester rheostat fully counterclockwise. Jumper B+ to Remote on TB12. Does Tester Cranking light come ON after a 2- to 3- second delay?	 28	 27
27.	Replace Time-Delay Start/Stop Module A15.	—	—
28.	Remove Module A12. Remove B+ to Remote Jumper on TB12. Does Tester Cranking light go off after 30-seconds? Reinstall Module A12.	 30	 29
29.	Replace Time-Delay Start/Stop Module A15. Return to item 26.	—	—
30.	Remove Tester Module plug in Cycle Cranker Board A14. Place Run-Stop-Remote switch in Run position. Does engine crank?	 —	 31
31.	Replace Cycle Cranker Module A14.	—	—

CONTROLS TROUBLESHOOTING

GENERAL

Before you start the troubleshooting procedure, visually inspect all wiring and connections. Check relay plug-in receptacles for cold solder joints. Look at the engine control modules for signs of burned or damaged solid state devices and again check for cold solder joints.

This troubleshooting guide assumes that your knowledge of the electric generating set will allow you to consider the nature of the fault before proceeding

For example, your set cranks without starting; you will check fuel, fuel lines, ignition carburetion, etc. If it does not crank —

Check Batteries

- Connected properly?
- Connections secure?
- Fully charged?

Starter Connections secure?

Remote Station start switch in correct position?

A few minutes spent logically analyzing a malfunction can save hours and expense on an inoperative generating set. Consult your engine operator's manual for engine troubleshooting information. This manual will help you with your electrical control problems.

To use this guide, answer the question either "yes" or "no" then proceed to the step given In the column containing your answer.

QUESTION AND ANSWER TROUBLESHOOTING GUIDE

NOTE: Place R-S-R switch in Run position when making voltage measurements.

ITEM	A. ENGINE FAILS TO CRANK. SWITCH IN "RUN" POSITION.	YES	NO
1.	Are batteries connected properly, is voltage normal?	2	—
2.	Toggle R-S-R switch between Stop and Run. Does Relay K-11 Actuate (observe visually)?	8	3
3.	Apply temporary jumper between K-11 pin A and ground terminal. Toggle R-S-R switch. Does relay K-11 actuate?	4	5
4.	Replace Starter Disconnect module, A17.	—	—
5.	Unplug K-11. Measure voltage at relay socket Pin B. Is voltage +24VDC (R-S-R switch) in Run position?	6	7
6.	Replace K-11 relay.	—	—
7.	Check voltage at R-S-R switch terminal 6 (switch in Run position), if not +24VDC, replace switch. Check wiring between switch and K-11 relay. Repair as necessary.	—	—
8.	Does K-13 starter relay actuate? Actuation can be verified by sound or feel.	9	11
9.	Measure voltage at large terminal on starter. Is voltage +24VDC?	10	11
10.	Replace starter.	—	—
11.	Apply temporary jumper between TB-11 terminal 26 and K-13 terminal 2. Does relay actuate?	14	12
12.	Measure voltage at TB11-26. Is voltage +24VDC?	13	16
13.	Replace K-13 starter solenoid.	—	—
14.	Measure voltage at pin 1 of K-14. Starter Protection Relay. If no voltage, measure at pin 7. Is voltage +24VDC?	15	—
15.	(a) If +24VDC at pin 1, replace A14 cranker module. (b) If +24VDC at pin 7 but not at pin 1, replace K-14 Starter protection relay. (c) If no voltage at pin 7, measure voltage at pin 7 of K-11. If voltage (+24VDC) at pin 7, check wire from K-11 Pin 4 to K14 pin 7. Repair if necessary or replace K-11 relay.	—	—
16.	Toggle R-S-R switch between Run and Stop and observe K-12 relay. Does K-12 relay actuate?	19	17
17.	Apply temporary jumper from TB-11 terminal 24 to K-12 Pin B. Does relay actuate?	19	18
18.	Replace K-12 relay.	—	—

ITEM	B. ENGINE FAILS TO CRANK. SWITCH IN "REMOTE" POSITION.	YES	NO
	This Guide is concerned with failure to crank in Remote only. Fault light "ON" should be solved after this malfunction, refer to section on Fault Lights.		
1.	Are switches in correct starting position? Set-control panel R-S-R switch to Remote? Remote station switch to Start? **If remote station is an ONAN automatic transfer switch, the test transfer switch should be placed to NORMAL position.**	2	—
2.	Place set control panel R-S-R switch in Run position. Does set crank and start?	3	Guide A
3.	Return R-S-R switch to Remote (see item 6). a. If remote station is an ONAN automatic transfer switch, place Test transfer switch to TEST position. Does set crank? b. If remote station is not an ONAN automatic transfer switch, refer to operator's manual for manual start switch. Place to START. Does set crank?	4 4	5 5
4.	Replace T.D. Start/Stop module A15.	—	—
5.	Check wiring between generator set and remote station. Repair where necessary.	—	—
6.	If remote station is a manual switch box proceed as follows: Return R-S-R switch to REMOTE. Apply jumper across TB-12 - B+ and TB12-RMT. After 10 seconds does engine crank?	7	10
7.	Apply jumper across remote station Start switch. Does engine crank?	8	—
8.	Replace remote station START switch.	—	—
9.	Check wiring between generator set and remote station. Repair where necessary.	—	—
10.	Replace T.D. Start/Stop module, A15.	—	—

QUESTION AND ANSWER TROUBLESHOOTING GUIDE

FIVE LIGHT SYSTEM

ITEM	C. ENGINE MALFUNCTION SHUTDOWN, FAULT LIGHT "ON".	YES	NO
1.	Which of the following fault lamps is lit a. Overcrank (after 75-seconds)? b. Overspeed? c. Low Oil Pressure? d. High Engine Temperature?	 2 5 10 14	 — — — —
2.	Check fuel system: Are valves open? Tanks full?	 — 3	 — —
3.	Check Ignition system. Refer to troubleshooting section of engine manufacturer's operator's manual. Is ignition OK?	 4	 —
4.	Refer to Troubleshooting guide A, items 2 through 7.	—	—
5.	Check throttles for freedom of movement. Are throttle linkages binding? Governor linkage free and clear?	 6	 —
6.	Is injector rack movement free?	7	—
7.	Remove air cleaners. Are filters clean and dry? No fuel saturation?	 8	 —
8.	Restart engine. Is Governor set correctly? **Woodward governors have optionally installed externally-controlled motors. Adjust governor with switch on control panel.**	 9	 —
9.	Replace Engine Monitor module A14.	—	—
10.	Is oil at correct level?	11	—
11.	Is oil pressure sensor working correctly?	12	—
12.	Disconnect wire from TB11-30. Does light remain ON?	 13	 —
13.	Replace Engine Monitor module A14.	—	—
14.	Is coolant level correct? If city water cooled, is input solenoid valve open?	 15	 —
15.	Is radiator cooling duct free of obstruction?	16	—
16.	Are fan belts tight?	17	—
17.	Is temperature sensor OK?	18	—
18.	Is thermostat opening?	—	—
19.	Disconnect wire A11-1 from TB11-34. Does light remain ON?	 20	 —
20.	Replace Engine monitor module, A14.	—	—

QUESTION AND ANSWER TROUBLESHOOTING GUIDE

SINGLE LIGHT SYSTEM

ITEM	D. ENGINE MALFUNCTION SHUTDOWN. FAULT LIGHT ON.	YES	NO
1.	Are fuel valves open?	2	—
2.	Are fuel tanks full?	3	—
3.	Place R-S-R switch to Stop. Depress Reset Switch. Place Switch to run. Does Engine start and continue to run? Does engine start? Does engine start and shutdown?	 — — 5	 — 4 —
4.	If natural-gas operated engine check ignition. Is ignition OK (K15 relay operated)?	—	—
5.	Is the elapsed time between start and shutdown less than 5 seconds?	8	6
6.	Is the elapsed time between start and shutdown approximately 10-seconds? **Penn State units, ignore this instruction.**	13	7
7.	Is the elapsed time between start and shutdown approximately 75-seconds?	21	—
8.	Check throttle linkage, governor linkage for freedom of movement. Do controls operate easily, no binding?	9	—
9.	Is injector rack movement free?	10	—
10.	Remove air cleaners. Are filters clean and dry? No fuel saturation.	11	—
11.	Is governor speed control set correctly? See operator's manual for correct adjustment procedure.	12	—
12.	Replace Engine Monitor module, A14.	—	—
13.	Is oil at correct level?	14	—
14.	Is oil pressure sensor working correctly?	15	—
15.	Check water temperature gauge on instrument panel. Is temperature reading high? (i.e., full scale)	16	19
16.	Check coolant level. **WARNING** **Bleed off block coolant pressure before attempting to remove filler cap. Severe liquid burns could result from erupting coolant.** Is coolant level correct?	17	—
17.	On city water cooled units, is input valve open?	17	—
18.	On radiator cooled units, is radiator clear of obstruction?	19	—
19.	Is engine temperature thermal switch operating OK?	20	—
20.	Replace Engine Monitor Module A12.	—	—

ITEM	D. ENGINE MALFUNCTION SHUTDOWN. FAULT LIGHT ON. (Continued)	YES	NO
21.	Toggle R-S-R Switch between Stop and Run. Does relay K11 actuate (observe visually)?	—	22
22.	Apply temporary jumper between K11 pin A and ground terminal. Toggle R-S-R switch. Does relay K11 actuate?	23	24
23.	Replace Starter Disconnect module, A17.	—	—
24.	Unplug K11. Measure voltage at relay socket Pin B. Is voltage +24VDC (R-S-R switch in Run position)?	25	26
25.	Replace K11 relay.	—	—
26.	Check voltage at R-S-R switch terminal 6 (switch in Run position). If not +24VDC, replace switch. Check wiring between switch and K11 relay. Repair as necessary.	—	—

NOTES

WIRING DIAGRAMS

* - Use for DHA and DHB.

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A11. ENGINE SHUTDOWN MODULE

Receives signals from Engine Monitor module (A12) to apply +24VDC to alarm circuit and break circuit to de-energize relay K12 for engine shutdown.

Voltage Measurements.

Condition: R-S-R switch in Stop position.

+24VDC at pin 8 only (O-VDC when Alarm Reset switch depressed).

Condition: R-S-R switch in Run or Remote (Engine running).

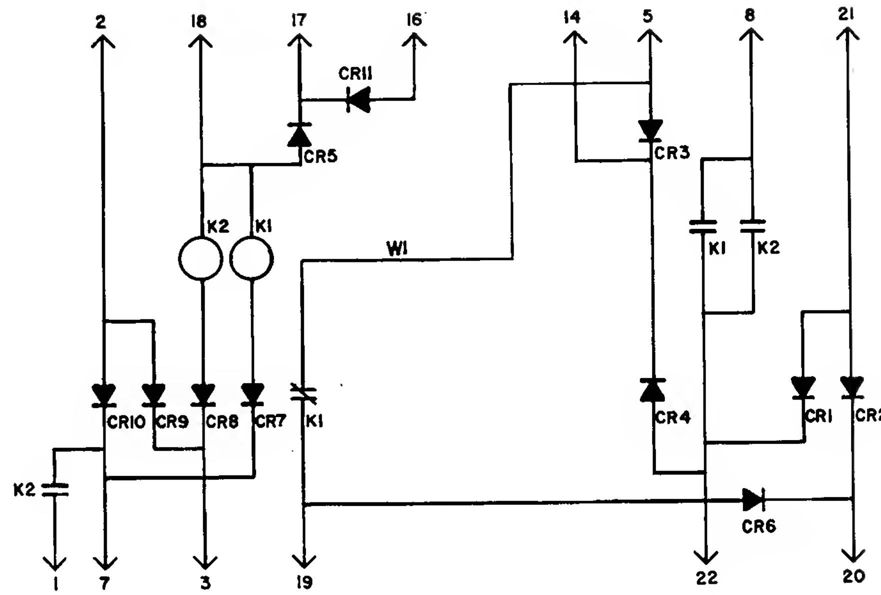
Pin	1-Light	5-Light	+24VDC	OVDC	Gnd
1	X				X
		X		X	
2	X	X		X	
3	X	X	X		
5	X	X	X		
7	X	X	X		
8	X	X	X		
14	X	X	X		
16	X			X	
			X	X	
17	X	X	X		
18	X	X	X		
19	X	X	X		
20	X	X	X		
21	X	X			X
22	X	X		X	

Condition: R-S-R in Run or Remote (Engine Malfunction Shutdown)

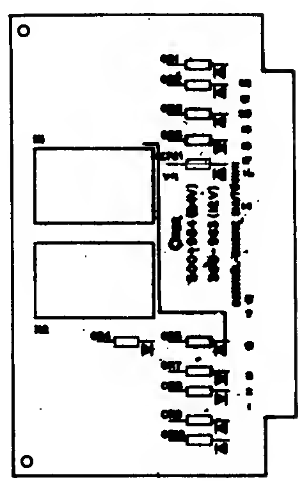
Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf	LOP	HET	O/S	O/C
1		X			X		X	X		
	X					X				
2	X	X		X						
3		X					X	X		
	X					X				
5	X	X	X							
7		X			X				X	X
8	X	X	X							
14	X	X	X							
16		X		X			X			
17	X	X	X							
18	X	X	X							
19	X	X		X						
20	X	X		X						
21	X	X			X					
22	X	X	X							

Do not make measurements on any module, unless that module is first plugged into an extender board.

SCHEMATIC DIAGRAM



MECHANICAL ASSY



Tolley	price	tp	pur	mo	Onan	DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
weld	so	hsg	gd	qc		
sec	punch	crank	ct		MODULE-ENG SHUTDOWN	
DATE			SC NONE			
MODEL	YB (24 V)		DWG NO.	300-954	DWG SIZE	C

A12. ENGINE MONITOR MODULE

Applies signals to A11 module for alarm and engine shutdown functions. Cranking time of 75-seconds is adjusted on this board.

Voltage Measurements.

Condition: R-S-R switch in Stop position.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd
4	X	X			X
8	X	X			X
22	X	X			X

Condition: R-S-R Switch in Run or Remote — Engine Malfunction Shutdown.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf	LOP	HET	O/S	O/C
1	X	X		X						
2	X	X		X						
4	X	X			X		X			
5		X*		X			X			
	X			X			X	X	X	X
6		X*		X					X	
	X			X			X	X	X	X
8	X	X			X					
13/14		X	X						X	X
		X		X			X	X		
	X				X		X	X		
18	X				X				X	X
20	X	X	X							
21		X		X					X	X
	X*			X			X	X	X	X
22	X	X			X					

Condition: R-S-R Switch in Run or Remote — Engine Running.

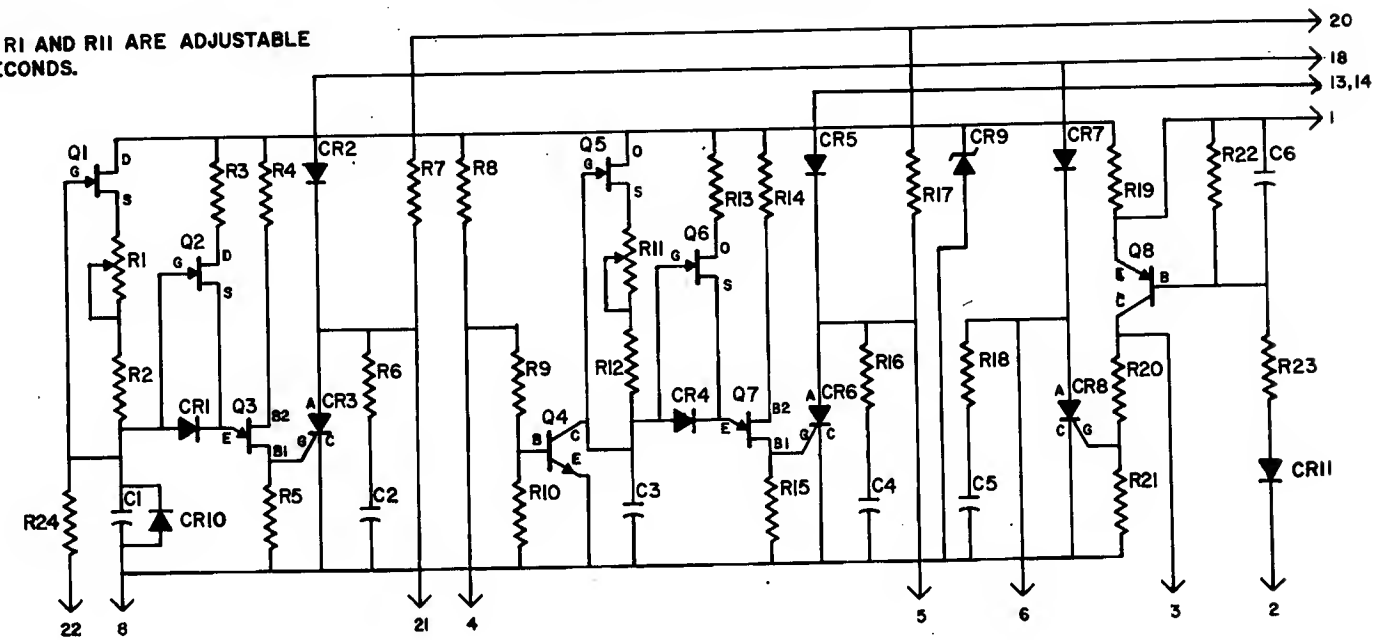
Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf	LOP	HET	O/S	O/C
1	X	X	X							
2	X	X	X							
4	X	X	X							
5	X	X	X							
6	X	X	X							
8	X	X			X					
13/14	X	X	X							
18	X	X	X							
20	X	X	X							
21	X	X	X							
22	X	X			X					

* - Normally +24VDC.

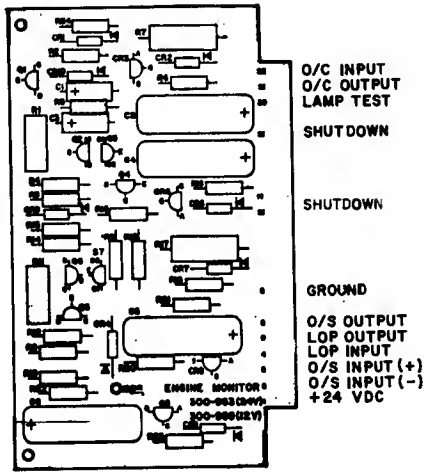
Do not make measurements on any module unless an extender card is used. Make measurements at extender card only.

SCHEMATIC DIAGRAM

POTENTIOMETERS RI AND RII ARE ADJUSTABLE FROM 0 TO 90 SECONDS.



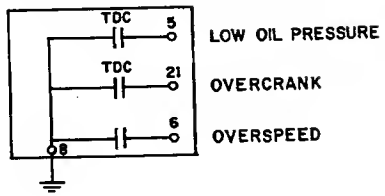
MECHANICAL ASSY



SPECIFICATIONS

B+ POWER	24 ± 6 VDC
LOW OIL PRESSURE TIME DELAY (TDC)	12.5 ± 2.5 SEC.
OVERCRANK TIME DELAY (TOC)	75 ± 5 SEC.
STORAGE TEMPERATURE	-40°C TO 100°C
OPERATING TEMPERATURE	-40°C TO 80°C

DIAGRAM SYMBOL



DATE 10-13-72						SC NONE	

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODULE-ENG MONITOR(24V)

YB

300-953

C

A13. REMOTE INDICATOR MODULE

Used with five fault light systems only, to light fault indicators at remote stations

Voltage Measurements.

Condition: R-S-R switch in Stop position.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf
1 thru 10	X	X		X		
11	X	X	X			
12	X	X		X		
13	X	X			X	
14 thru 21	X	X		X		

Condition: R-S-R Switch in Run or Remote — Engine Running.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf	LOP	HET	O/S	O/C
1		X	X							
2		X		X						
3		X	X							
4		X		X						
5		X	X							
6		X		X						
7		X	X							
8		X	X*							
9		X	X*							
10		X	X**							
11		X	X							
12		X		X						
13		X			X					
14		X	X							
15		X	X							
20		X	X							

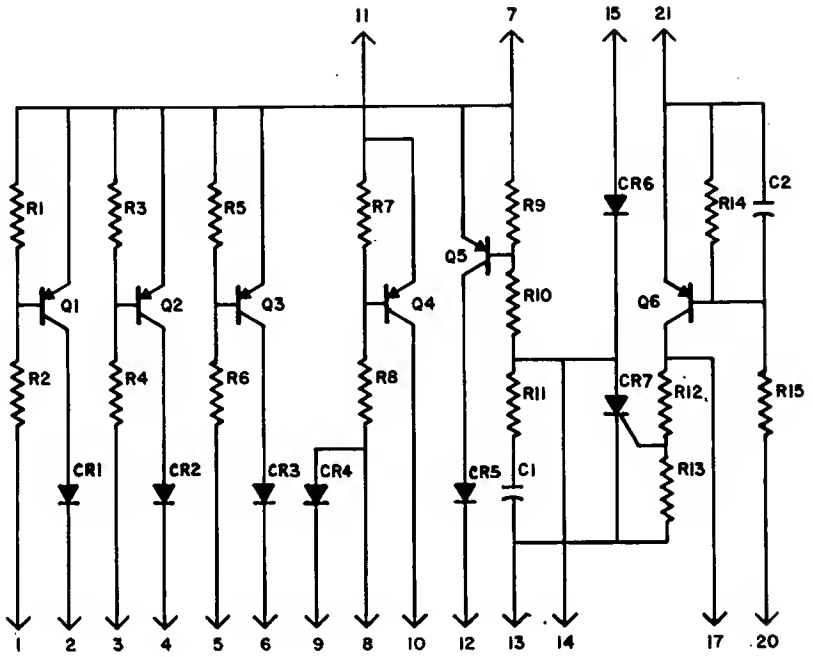
Condition: R-S-R- Switch in Run or Remote — Engine Malfunction Shutdown.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	Inf	LOP	HET	O/S	O/C
1		X		X			X			
2		X		X			X			
3		X		X					X	
4		X		X					X	
5		X		X						X
6		X		X						X
7		X	X							
8		X	X*							
9		X	X*							
10		X	X*							
11		X	X							
12		X	X					X		
13		X			X					
14		X	X					X		
15		X		X			X	X		
20		X		X						
21		X		X						

* - OVDC until engine hot.
** - 24VDC until engine hot.

Do not make voltage measurements on any module unless an extender card is used. Make measurements at extender card only.

SCHEMATIC DIAGRAM



MECHANICAL ASSY

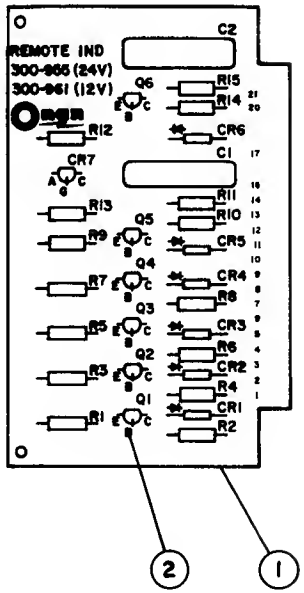
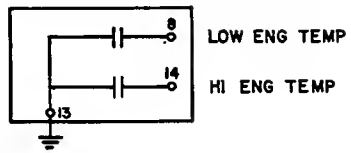


DIAGRAM SYMBOL



ITEM	PART NO.	SPEC SIZE	QTY	BULK	DESCRIPTION OR MATERIAL
	Relay price tp pur				Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld ss hsg gd qc				
	sec punch crank ck pc				MODULE - REMOTE IND(24V)
DATE 12-12-72		PC NONE			
DRAWN YB			APPD	300-955	SIZE C

A14 CYCLE CRANKING MODULE

Adjustable time limits within this module provide for 3 Crank and 2 Rest period cycles within the 75-second parameter of the overcrank set by module A12.

Cranking Cycle

Pin	+24VDC	OVDC	Gnd
1	X		
2	X		
3	X		
4	X		
5	X		
7			X

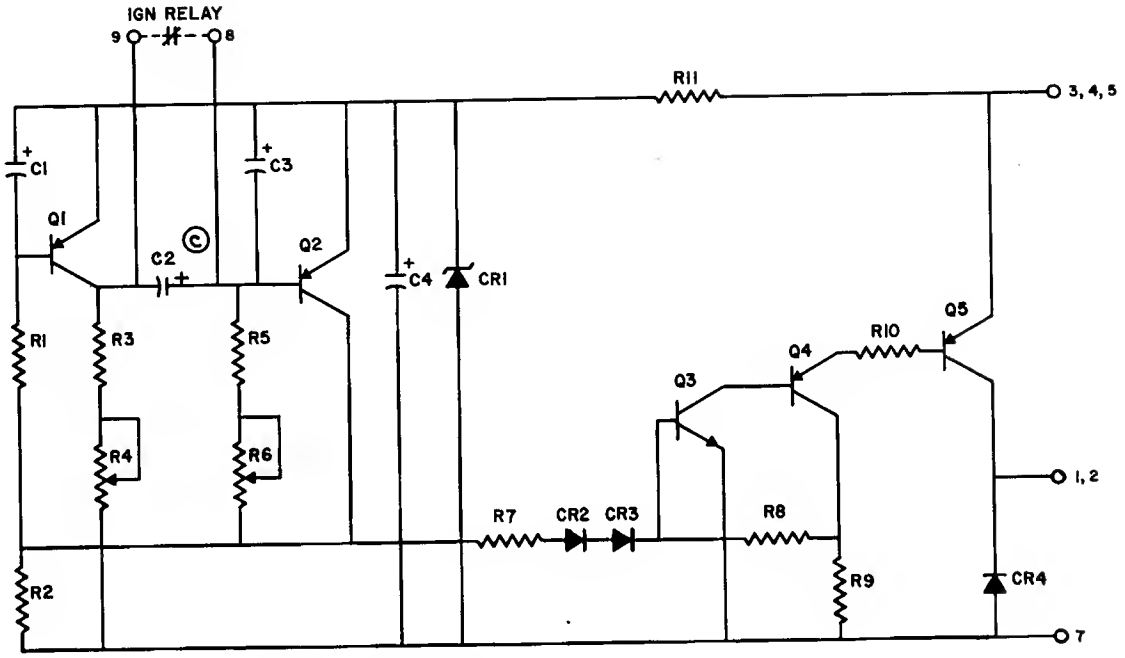
Rest Cycle

Pin	+24VDC	OVDC	Gnd
1		X	
2		X	
3	X		
4	X		
5	X		
7			X

Engine Running

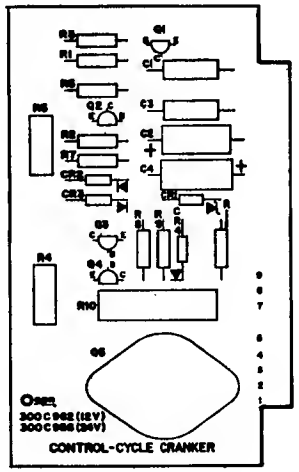
Pin	+24VDC	OVDC	Gnd
1		X	
2		X	
3		X	
4		X	
5		X	
7			X

SCHEMATIC DIAGRAM



FACTORY ADJUST POTENTIOMETER R6 FOR 10±2 SEC REST TIME
FACTORY ADJUST POTENTIOMETER R4 FOR 15±2 SEC CRANK TIME

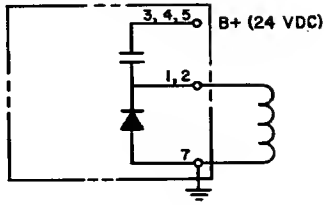
MECHANICAL ASSY



SPECIFICATIONS

B+ POWER	24 ± 6 VDC
CRANK TIME	15 ± 2 SEC
REST TIME	10 ± 2 SEC
OPERATING TEMPERATURE	-40°C TO 80°C
STORAGE TEMPERATURE	-40°C TO 100°C

DIAGRAM SYMBOL



	50✓ Relay	price	tp	pur	me	Onan	DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	sa	hsg	gd	qc		
	sec	punch	crank	ck	go ✓		MODULE-CYCLE CRANKER(24V)
DATE 12-12-72				SC NONE			
ENGR YB						DWG 300-956	SIZE C

A14A. STANDARD CRANKING MODULE

Allows engine to crank until it either starts or the Overcrank circuit in module A12 shuts down the cranking system at 75-seconds.

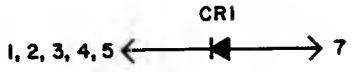
Cranking Cycle

Pin	+24VDC	0VDC	Gnd
2	X		
3	X		

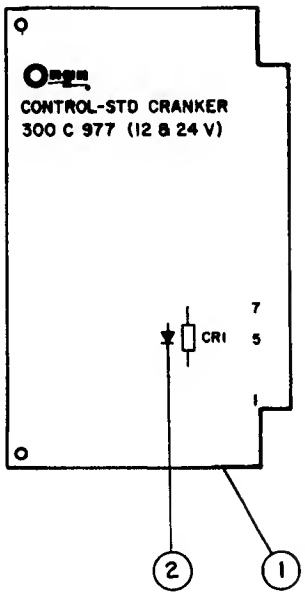
Engine Running

Pin	+24VDC	0VDC
2		X
3		X

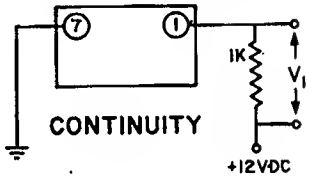
SCHEMATIC DIAGRAM

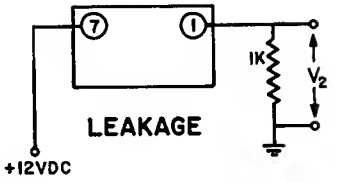


MECHANICAL ASSY



TEST DIAGRAM





REF. DES.	ITEM	PART NO.	SPEC SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL
CR1	3	357-4	A	1		RECTIFIER-DIODE
	2	98-2526	A	1		SILKSCREEN-PC BD
	1	332-1552	D	1		PRINTED CIRCUIT BOARD

DR Bushard — CKR CDR — ENGR — SAMP REL — PROD REL — PROD REL

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

DATE 11-29-72 — SC NONE

MODULE-STD CRANKER

SCOPE YB — MODEL 300-977

A15 TD START/STOP MODULE

Available as an option, this module allows time delayed start or stop operation from a remote station. Delay times are adjustable through rheostats, accessible from the module panel, and are clearly identified.

Voltage Measurements.

Condition: R-S-R switch in Remote, remote start switch OFF.

Pin	1- Light	5- Light	+24VDC	OVDC	Gnd
1	X	X		X	
2	X	X		X	
5	X	X			X
6	X	X			X
9	X	X		X	
12	X	X		X	
17	X	X		X	
18	X	X		X	
20	X	X			X
21	X	X		X	

Condition: R-S-R Switch in Remote, remote start switch ON, engine running.

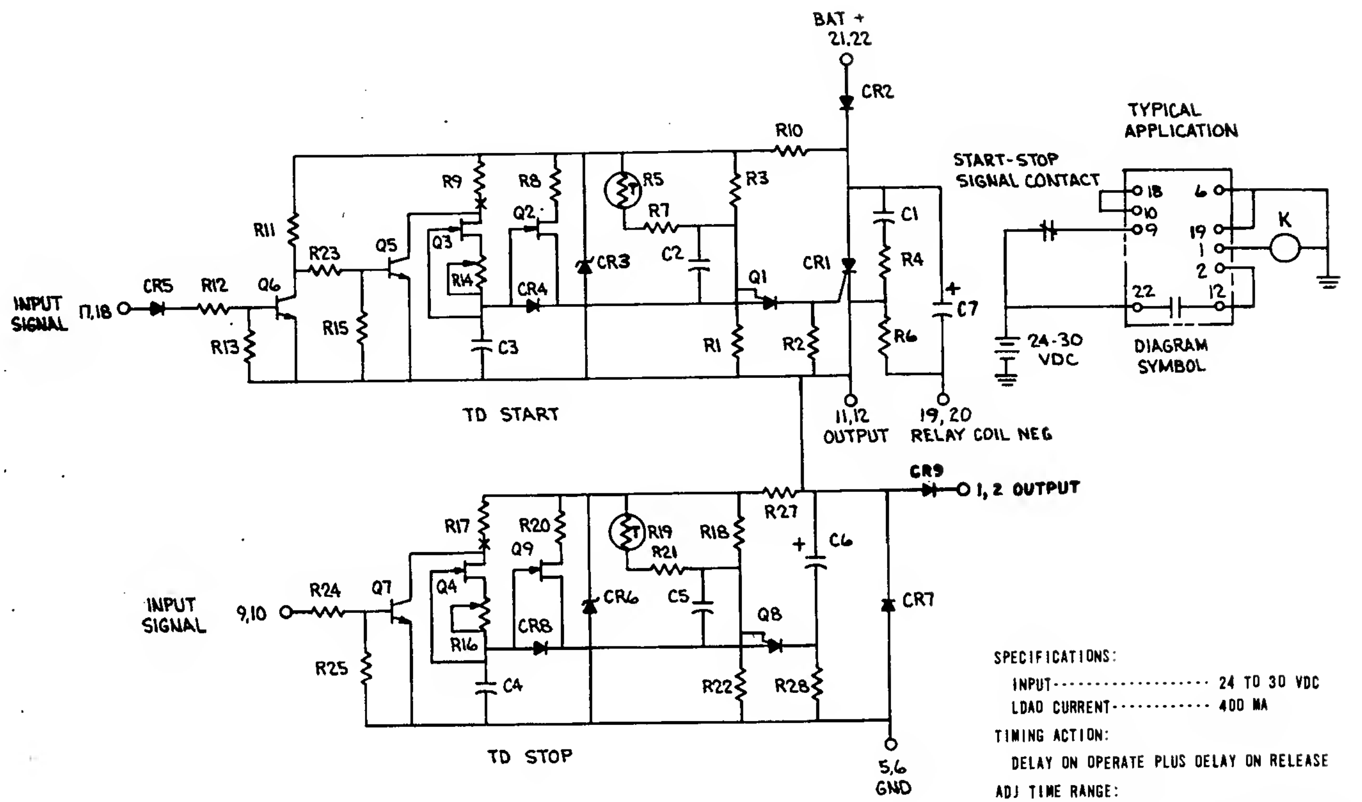
Pin	1- Light	5- Light	+24VDC	OVDC	Gnd
1	X	X	X*		
2	X	X	X*		
5	X	X			X
6	X	X			X
9	X	X	X		
12	X	X	X*		
17	X	X	X		
18	X	X	X		
20	X	X			X
21	X	X	X		

* - These pins will remain at +24VDC until Stop TD period has elapsed, when they will drop to 0-VDC.

Condition: Engine malfunction shutdown.

Above voltages (i.e., engine running) do not change.

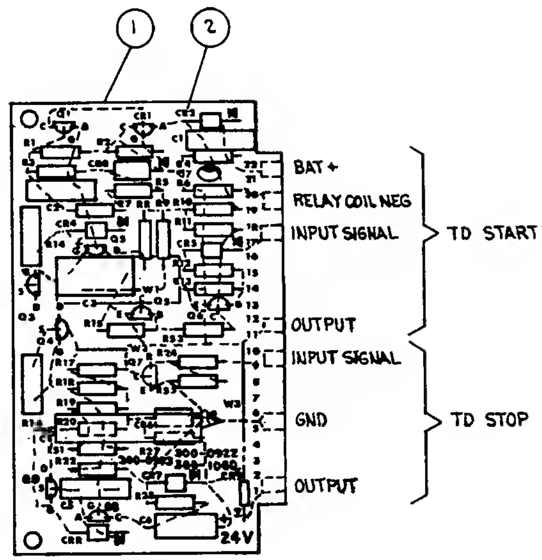
Do not make voltage measurements on any card unless an extender card is used. Make measurements at extender card only.



SPECIFICATIONS:
- INPUT .... 24 TO 30 VDC
- LOAD CURRENT .... 400 MA

TIMING ACTION:
- DELAY ON OPERATE PLUS DELAY ON RELEASE

ADJ TIME RANGE:
- START .... 0.5 TO 15 SECONDS
- STOP .... 0.5 TO 5 MINUTES
- TOLERANCE .... ±20%



Onan	DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
DATE 11-21-72	MODULE-T.D. START-STOP 24V
YB	300-973 C

A15A. BYPASS PLUG MODULE

Standard Installation.
This module is used when delays in engine start or stop are not required, or when a time delay module is used in an Automatic Transfer Switch. A passive unit, it is only required with Remote start/stop controls.

Voltage Measurements.
Condition: R-S-R switch in Stop position.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd
1	X	X		X	
2	X	X		X	
6	X	X			X
18	X	X		X	
20	X	X			X
21	X	X		X	

Condition: R-S-R Switch in Run position, engine running.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd
1	X	X	X		
2	X	X	X		
6	X	X			X
18	X	X		X	
20	X	X			X
21	X	X		X	

Condition: R-S-R Switch in Run position, engine running.

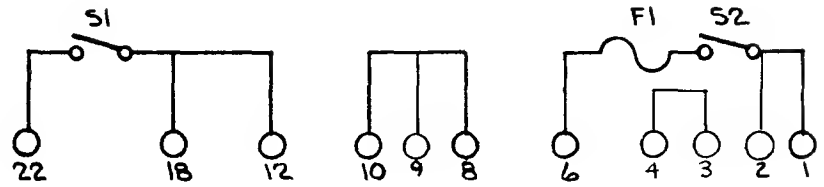
Pin	1-Light	5-Light	+24VDC	OVDC	Gnd
1	X	X	X		
2	X	X	X		
6	X	X			X
18	X	X	X		
20	X	X			X
21	X	X	X		

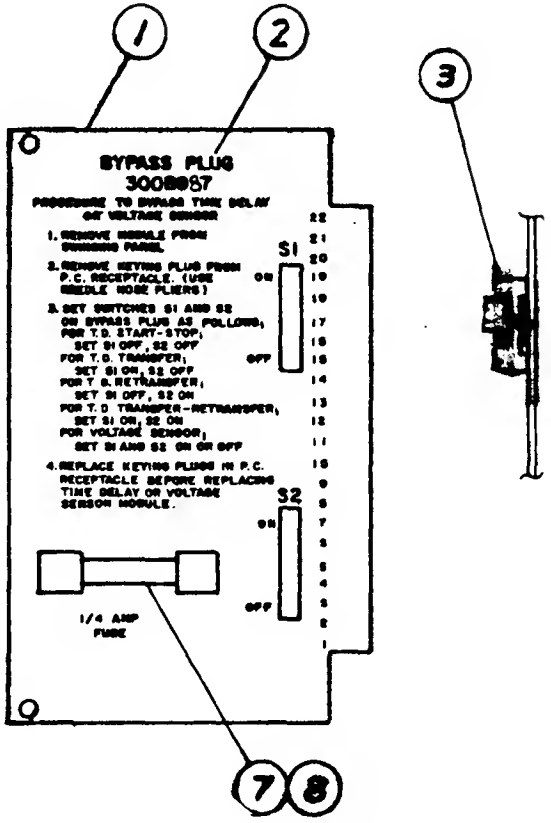
Condition: R-S-R switch in either Run or Remote, engine malfunction shutdown.

No change from above Run or Remote conditions.

NOTE 1. Do not make voltage measurements unless this module is first plugged into an extender card.

2. If replacing this Bypass module, verify that —
a. Switch S2 is open.
b. Switch S1 is open.





	9	880-3		1 OZ	SOLDER
F1	8 7 6 5	321-168 321-163	P	1 2	FUSE 1/4 AMP CLIP-FUSE
S1 2	4 3 2 1	308-324 98-2468 332-1464	A A C	2 1 1	SWITCH-SLIDE SILKSCREEN-PC 80 PRINTED CIRCUIT BOARD

ITEM	PART NO.	DWG SIZE	QTY	* BULK	DESCRIPTION OR MATERIAL

95 Relay price tp pur me
weld so hsg gd qr
sec punch crank ck po

Onan DIVISION OF ONAN CORPORATION Minneapolis, Minnesota

DATE 1-8-75 SC 1:1

TITLE MODULE-BYPASS PLUG

MODEL YB

DWG NO 300-987

A16. OVERSPEED SENSOR MODULE

Standard installation, shuts down the generator set in the event of an overspeed condition.

Voltage Measurements.

Condition: R-S-R switch in Stop position.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	600 Hz*
1	X	X				X+
2	X	X				X+
3	X	X			X	
4	X	X			X	
5	X	X		X		
6	X	X		X		
17	X	X	X			
18	X	X	X			
19	X	X				X**
20	X	X				X**
21	X	X				X**
22	X	X				X**

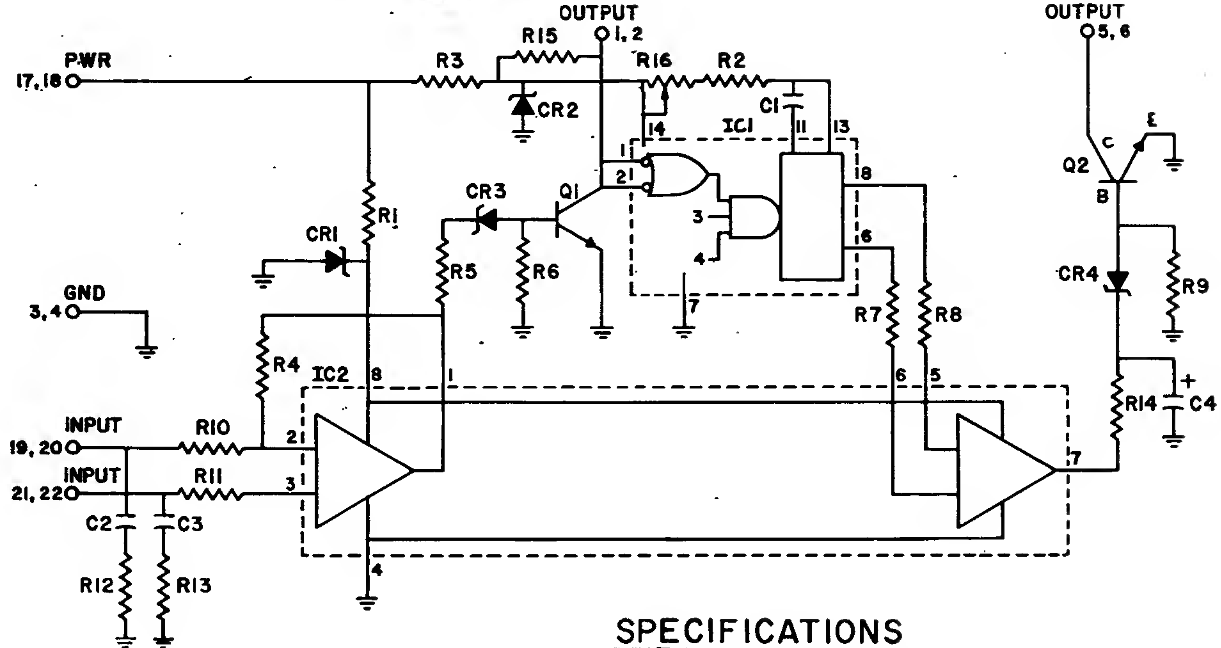
* - 1800 r/min frequency.
** - Frequency amplitude 200- to 400-MVAC sine wave.
\+ - Pins 1 and 2; frequency amplitude 4- to 5-VDC square wave.

Condition: R-S-R Switch in Run or Remote position, Engine Overpseed Shutdown.

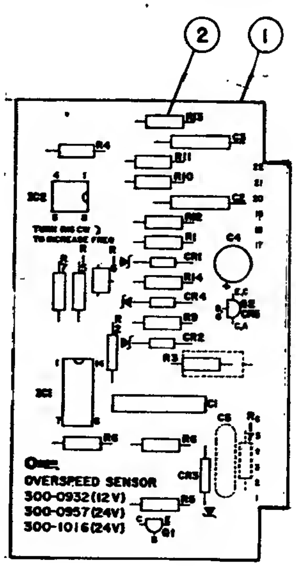
Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	600 Hz*	OHz
1	X	X					X
2	X	X					X
3	X	X			X		
4	X	X			X		
5	X	X			X		
6	X	X			X		
17	X	X	X				
18	X	X	X				
19	X	X					X
20	X	X					X
21	X	X					X
22	X	X					

Do not make voltage measurement on any module unless an extender card is used. Make measurements on extender card.

SCHEMATIC



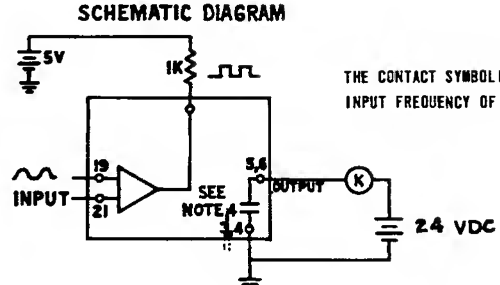
MECHANICAL ASSY



SPECIFICATIONS

INPUT VOLTAGE------------------- 300±100 MVAC
INPUT FREQUENCY----------------- 0-800 HZ
VOLTAGE B+---------------------- 24 ±6 VDC
OUTPUT CURRENT
OUTPUT 1,2------------------ 100 MA MAX
OUTPUT 5,6------------------ 100 MA MAX
OUTPUT VOLTAGE
OUTPUT 1,2------------------ $5V^{+0}_{-1}$ VDC
OUTPUT 5,6------------------ 24 ±6 VDC

SYMBOL FOR SCHEMATIC DIAGRAM



THE CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT CLOSES AT AN INPUT FREQUENCY OF 700 HZ ±30 HZ.

Onan	DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
DATE 11-10-72	MODULE -OVERSPEED SEN
MODEL YB	DWG NO. 300-0957 — DWG SIZE C

A17. STARTER DISCONNECT MODULE

Standard installation, disconnects starter circuit at 450 to 570 Hz, reconnects starter at 0- to 30 Hz.

Voltage Measurement.

Condition: R-S-R switch in Stop position.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	0- to 570 Hz*
1	X	X			X	
17	X	X			X	
19	X	X	X			
20	X	X	X			
21	X	X				X
22	X	X				X

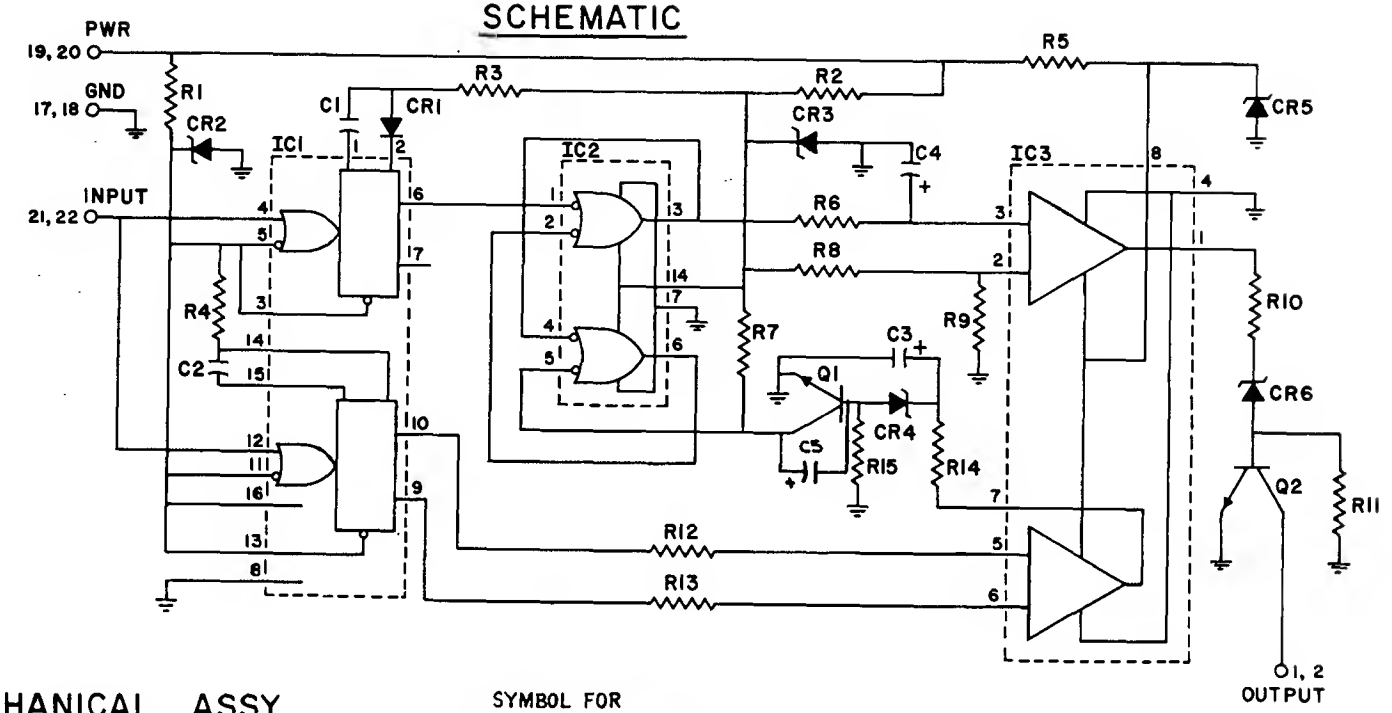
Condition: Engine running.

Pin	1-Light	5-Light	+24VDC	OVDC	Gnd	600 Hz*
1	X	X	X			
17	X	X			X	
19	X	X	X			
20	X	X	X			
21	X	X				X
22	X	X				X

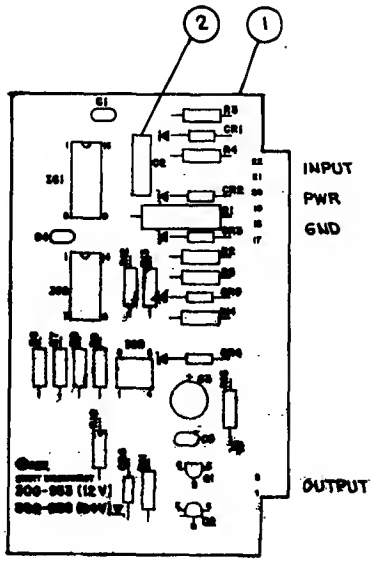
* - Measure with an oscilloscope. Frequency amplitude 5VDC, square wave.

Do not make voltage measurements on any module unless an extender card is used. Make measurements on extender card.

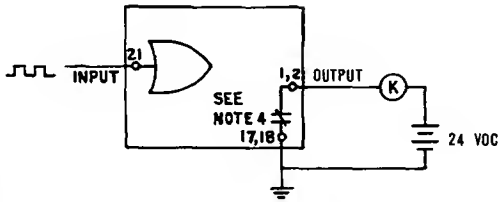
SCHEMATIC



MECHANICAL ASSY



SYMBOL FOR SCHEMATIC DIAGRAM



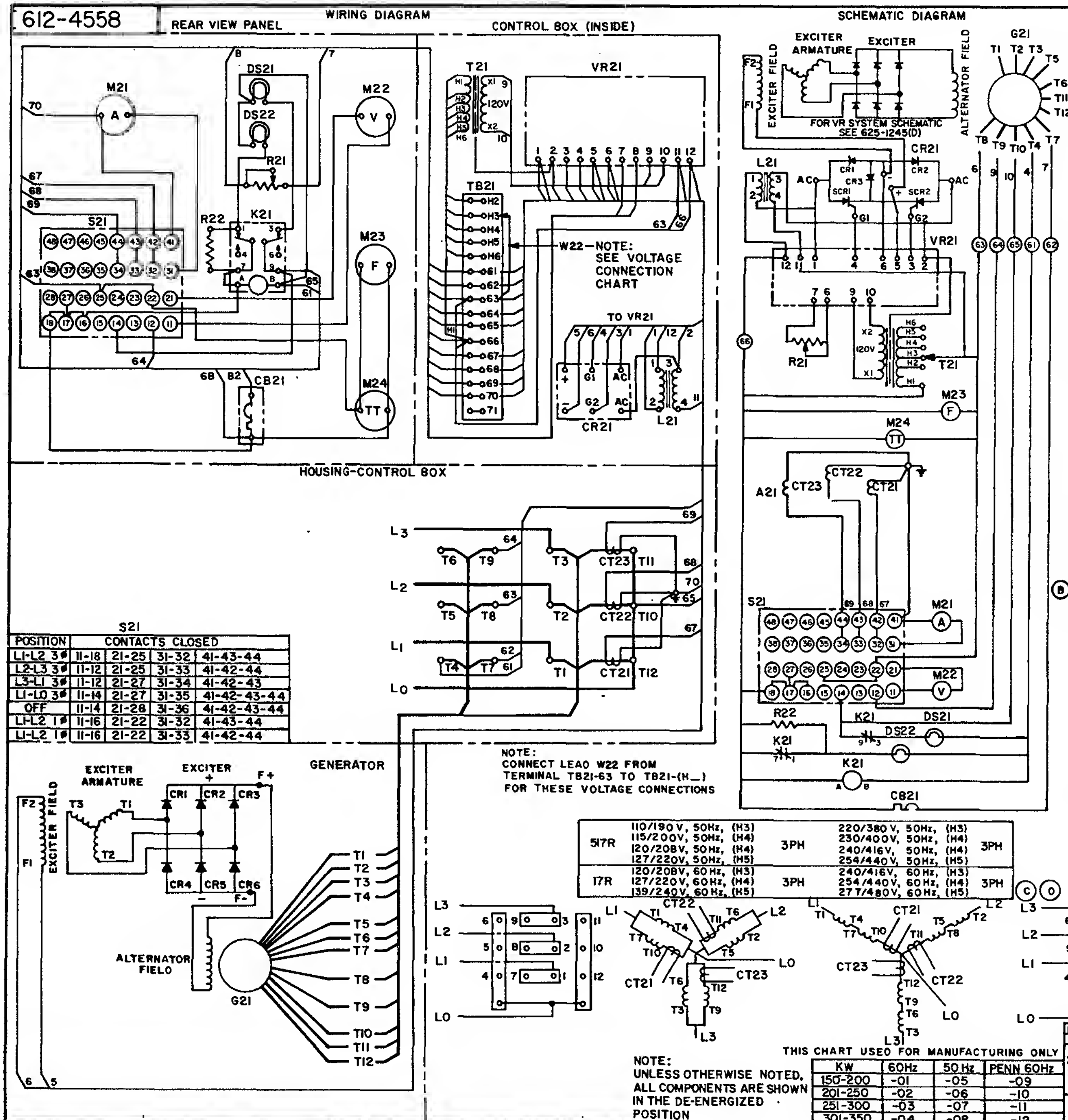
THE CONTACT SYMBOLIZES A SOLID STATE SWITCH THAT OPENS AT AN INPUT FREQUENCY OF 170 HZ ±20HZ AND RECLOSES AT 10±10 HZ.

SPECIFICATIONS

INPUT VOLTAGE	$5V^{+0}_{-1}$ SQ WAVE
INPUT FREQUENCY	0-400 HZ
B+ POWER	24 ±6 VDC
LOAD CURRENT	100MA MAX
LOAD VOLTAGE	24 ±6 VDC

	relay	price	tp	pur	me	Onan	DIVISION OF ONAN CORPORATION Minneapolis, Minnesota
	weld	so	hsg	gd	qc		
	sec	punch	crank	ck	po		
DATE	11-8-72	sc	—			TITLE	MODULE-STARTER DISC
MODEL	YB					DRAWING	300-0958

WIRING DIAGRAM — SCHEMATIC DIAGRAM



S21

POSITION	CONTACTS CLOSED			
L1-L2 3ø	11-18	21-25	31-32	41-43-44
L2-L3 3ø	11-12	21-25	31-33	41-42-44
L3-L1 3ø	11-12	21-27	31-34	41-42-43
L1-L0 3ø	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L1-L2 1ø	11-16	21-22	31-32	41-43-44
L1-L2 1ø	11-16	21-22	31-33	41-42-44

NOTE: CONNECT LEAD W22 FROM TERMINAL TB21-63 TO TB21-(H_) FOR THESE VOLTAGE CONNECTIONS

517R	110/190V, 50Hz, (H3) 115/200V, 50Hz, (H4) 120/208V, 50Hz, (H4) 127/220V, 50Hz, (H5)	3PH	220/380V, 50Hz, (H3) 230/400V, 50Hz, (H4) 240/416V, 50Hz, (H4) 254/440V, 50Hz, (H5)	3PH
17R	120/208V, 60Hz, (H3) 127/220V, 60Hz, (H4) 139/240V, 60Hz, (H5)	3PH	240/416V, 60Hz, (H3) 254/440V, 60Hz, (H4) 277/480V, 60Hz, (H5)	3PH

NOTE: UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

THIS CHART USED FOR MANUFACTURING ONLY

KW	60Hz	50Hz	PENN 60Hz
150-200	-01	-05	-09
201-250	-02	-06	-10
251-300	-03	-07	-11
301-350	-04	-08	-12

AC CONTROL PARTS LIST

REF. DES.	PART NO	DWG NO	QTY.	DESCRIPTION
CB21	320-0455	B	1	CIRCUIT BREAKER, 3AMP
	320-0307	P	1	LOCK-CKT BRKR HANDLE(PENN STATE)
CR21	305-0524	C	1	RECTIFIER BRIDGE
CT21-23	302-0908	B	1	TRANSFORMER ASSY-CUR (150-200KW)
	302-0909	B	1	TRANSFORMER ASSY-CUR (201-250KW)
	302-0910	B	1	TRANSFORMER ASSY-CUR (251-300KW)
	302-0911	B	1	TRANSFORMER ASSY-CUR (301-350KW)
DS21	322-0131	A	1	LIGHT-UPPER SCALE
DS22	322-0130	A	1	LIGHT-LOWER SCALE
G21			1	GENERATOR
K21	307-1061	B	1	RELAY-VOLTAGE SELECTOR
	301-3244	B	1	BRACKET-RELAY MTG
	307-1157	P	1	SPRING-RELAY HOLDDOWN
L21	315-0384	B	1	REACTOR ASSY COMM
M21	302-0877	B	1	AMMETER-AC,0-400,0-800(150-200KW)
	302-0878	B	1	AMMETER-AC,0-500,0-1000(201-250KW)
	302-0879	B	1	AMMETER-AC,0-600,0-1200(251-300KW)
	302-0890	B	1	AMMETER-AC,0-750,0-1500(301-350KW)
M22	302-0718	B	1	VOLTMETER-AC,0-300,0-600
M23	302-0810	B	1	METER-FREQUENCY (60Hz)
	302-0894	B	1	METER-FREQUENCY (50Hz)
M24	302-0466	B	1	METER-RUNNING TIME (60Hz)
	302-0469	B	1	METER-RUNNING TIME (50Hz)
R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K 25W
	303-0032	P	1	KNOB-RHEOSTAT
R22	350-0556	(REF)	1	RESISTOR-47000, 1/2 WATT
S21	308-0284	B	1	SWITCH-VOLT & AMMETER
	303-0076	-	1	KNOB
T21	315-0342	O	1	TRANSFORMER-VOLT REF
TB21	332-1242	A	1	MARKER-STRIP
VR21	332-1268	O	1	BOARD ASSY-PC VOLTAGE RGLTR
	338-0730	D	1	WIRING HARNESS
W22	336-1913	A	1	LEAD ASSY
	301-3170	C	1	PANEL-GEN CONTROL
	301-3158	O	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	4	GROMMET-RUBBER
	98-2169	C	1	SILKSCREEN-CONTROL PANEL AC
	545-0023	A	1	PARTS LIST-AC CONT HOW
	232-2246	A	2	JUMPER-BUS BAR
	232-2248	A	3	JUMPER-BUS BAR
	98-2627	C	1	SILKSCREEN-CONTROL PANEL AC(REAR)

612-4558

LET	REVISION		DATE
D	WAS 277/480V (H3)		1-2-74
C	WAS 254/440V (H3)		1-2-74
B	WAS W1F		11-73
A	REVISED KW RATING		8-26-73
	SUPERSEDES DWG. SAME NO. WITH DWG DATED		6-19-72

Onan — DIVISION OF STUDEBAKER CORPORATION, Minneapolis, Minnesota

MODEL NO: 200-350KW-17R/1, 200-350KW-517R/1 BRUSHLESS; 3PH, 50/60Hz; 12W RECONNECTABLE

DATE 7-30-73 — DR. CIP — ENGR. SH — CKR. COR

NAME: CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG. NO. 612-4558 — DWG SIZE C

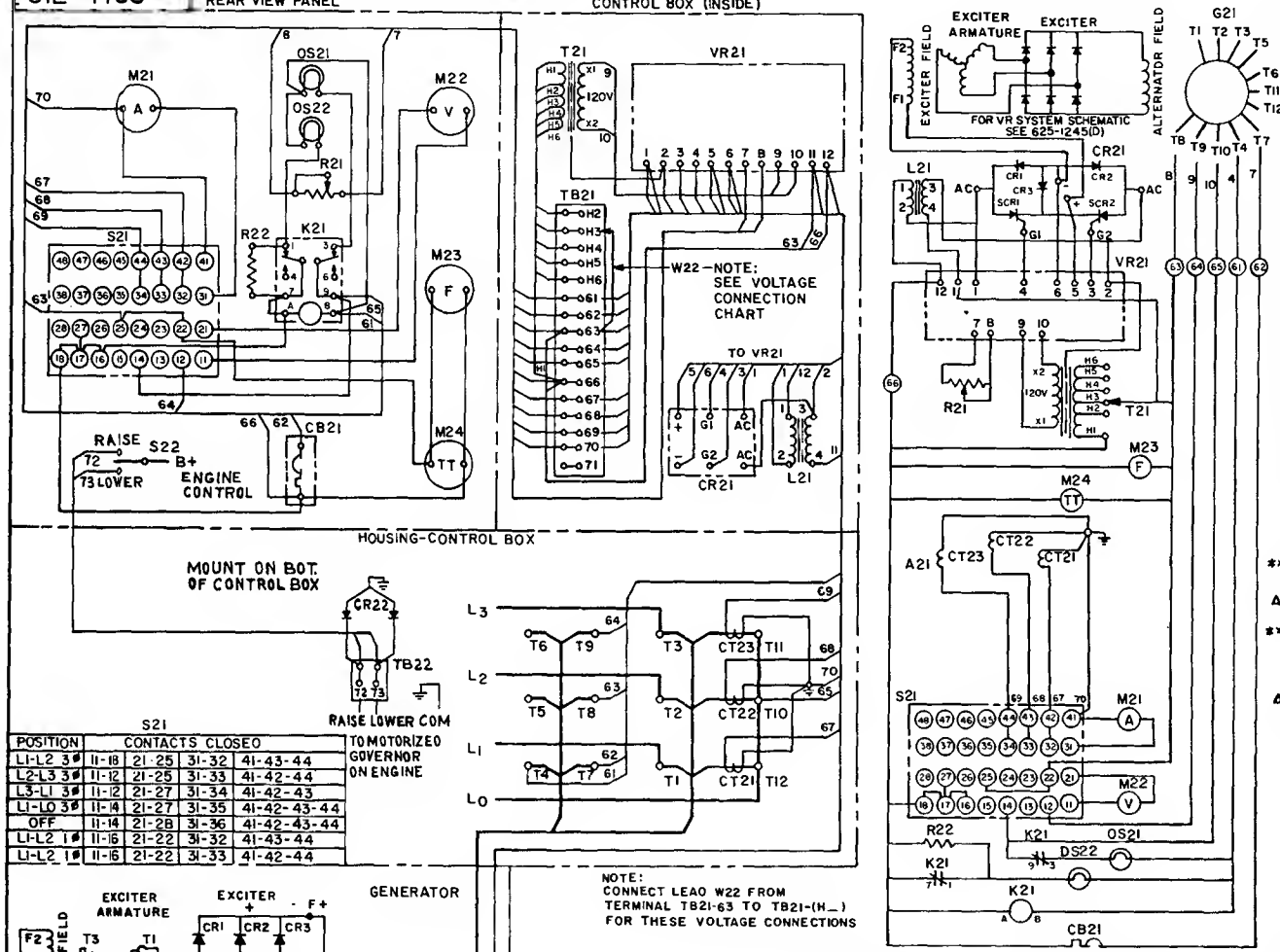
612-4753

WIRING DIAGRAM

REAR VIEW PANEL

CONTROL BOX (INSIDE)

SCHEMATIC DIAGRAM

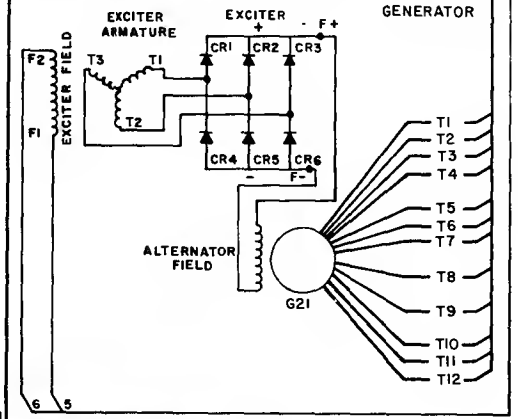


HOUSING-CONTROL BOX

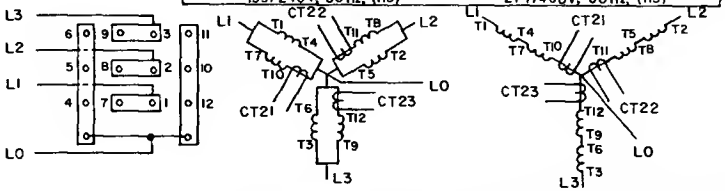
MOUNT ON BOT. OF CONTROL BOX

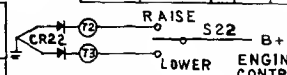
S21	CONTACTS CLOSED			
POSITION				
L1-L2 3Ø	11-18	21-25	31-32	41-43-44
L2-L3 3Ø	11-12	21-25	31-33	41-42-44
L3-L1 3Ø	11-12	21-27	31-34	41-42-43
L1-L0 3Ø	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
L1-L2 1Ø	11-16	21-22	31-32	41-43-44
L1-L2 1Ø	11-16	21-22	31-33	41-42-44

NOTE:
CONNECT LEAD W22 FROM TERMINAL TB21-63 TO TB21-(H_) FOR THESE VOLTAGE CONNECTIONS



5T7R	110/190V, 50Hz, (H3) 115/200V, 50Hz, (H4) 120/208V, 50Hz, (H4) 127/220V, 50Hz, (H5)	3PH	220/380V, 50Hz, (H3) 230/400V, 50Hz, (H4) 240/416V, 50Hz, (H4) 254/440V, 50Hz, (H5)	3PH
17R	120/208V, 60Hz, (H3) 127/220V, 60Hz, (H4) 139/240V, 60Hz, (H5)	3PH	240/416V, 60Hz, (H3) 254/440V, 60Hz, (H4) 277/480V, 60Hz, (H5)	3PH





NOTE:
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

THIS CHART USED FOR MANUFACTURING ONLY

KW	60Hz	50 Hz	PENN 60Hz
150-200	-01	-05	-09
201-250	-02	-06	-10
251-300	-03	-07	-11
301-350	-04	-08	-12

AC CONTROL PARTS LIST

	REF. DES.	PART NO.	DWG NO.	QTY.	DESCRIPTION
*	CR22	357-0019	A	1	0100E ASSY
	CB21	320-0455	B	1	CIRCUIT BREAKER, 3AMP
		320-0307	P	1	LOCK-CKT BRKR HANDLE(PENN STATE)
*	CR21	305-0524	C	1	RECTIFIER BRIDGE
	CT21-23	302-0908	B	1	TRANSFORMER ASSY-CUR (150-200KW)
		302-0909	B	1	TRANSFORMER ASSY-CUR (201-250KW)
		302-0910	B	1	TRANSFORMER ASSY-CUR (251-300KW)
		302-0911	B	1	TRANSFORMER ASSY-CUR (301-350KW)
	DS21	322-0131	A	1	LIGHT-UPPER SCALE
	DS22	322-0130	A	1	LIGHT-LOWER SCALE
	G21			1	GENERATOR
	K21	307-1061	B	1	RELAY-VOLTAGE SELECTOR
		301-3244	B	1	BRACKET-RELAY MTG
		307-1157	P	1	SPRING-RELAY HOLDDOWN
	L21	315-0384	B	1	REACTOR ASSY COMM
	M21	302-0877	B	1	AMMETER-AC, 0-400, 0-800 (150-200KW)
		302-0878	B	1	AMMETER-AC, 0-500, 0-1000 (201-250KW)
		302-0879	B	1	AMMETER-AC, 0-600, 0-1200 (251-300KW)
		302-0880	B	1	AMMETER-AC, 0-750, 0-1500 (301-350KW)
	M22	302-0718	B	1	VOLTMETER-AC, 0-300, 0-600
	M23	302-0810	B	1	METER-FREQUENCY (60Hz)
		302-0894	B	1	METER-FREQUENCY (50Hz)
	M24	302-0466	B	1	METER-RUNNING TIME (60Hz)
		302-0469	B	1	METER-RUNNING TIME (50Hz)
	R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K 25W
		303-0032	P	1	KNOB-RHEOSTAT
	R22	350-0556 (REF)		1	RESISTOR-47,000, 1/2 WATT
	S21	308-0284	B	1	SWITCH-VOLT & AMMETER
**		303-0076	-	1	KNOB
	T21	315-0342	D	1	TRANSFORMER-VOLT REF
Δ	TB21	332-1242	A	1	MARKER-STRIP
	VR21	332-1268	D	1	BOARD ASSY-PC VOLTAGE RGLTR
**	S22	308-0154	A	1	SWITCH-GOVERNOR CONTROL
					612-4753
		338-0730	D	1	WIRING HARNESS
	W22	336-1913	A	1	LEAD ASSY
Δ	TB22	332-0609	A	1	TERMINAL-BLOCK
		332-0610	A	1	MARKER-STRIP
		301-3170	C	1	PANEL-GEN CONTROL (MODIFY)
		301-3158	D	1	CONTROL BOX
		402-0070	A	4	DAMPENER-VIBRATION
		337-0049	-	1	STRAP-BONO
		508-0001	P	4	GROMMET-RUBBER
		98-2169	C	1	SILKSCREEN-CONTROL PANEL AC
		545-0023	A	1	PARTS LIST-AC CONT HDW
		232-2246	A	2	JUMPER-BUS BAR
		232-2248	A	3	JUMPER-BUS BAR
		98-2627	C	1	SILKSCREEN-CONTROL PANEL AC (REAR)
		98-1651	A	1	SILKSCREEN-GOV CONT SWITCH

SUPERSEDES DWG, SAME NO WITH CHNG DATED 2-21-73

Onan — DIVISION OF STUDEBAKER CORPORATION, Minneapolis, Minnesota

PROD. REL.	MODEL NO.	DATE	BY	ENGR.	CHK.
	200-350KW-17R/7192 200-350KW-51R/7192 BRUSHLESS 3PH, 50/60Hz 12W RECONNECTABLE	3-19-74	CIP		

CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG NO. 612-4753 — DWG SIZE C

PO 31 42 53 60 PARTS

SEPIA FROM 612-4558

Rev. 7-75

65

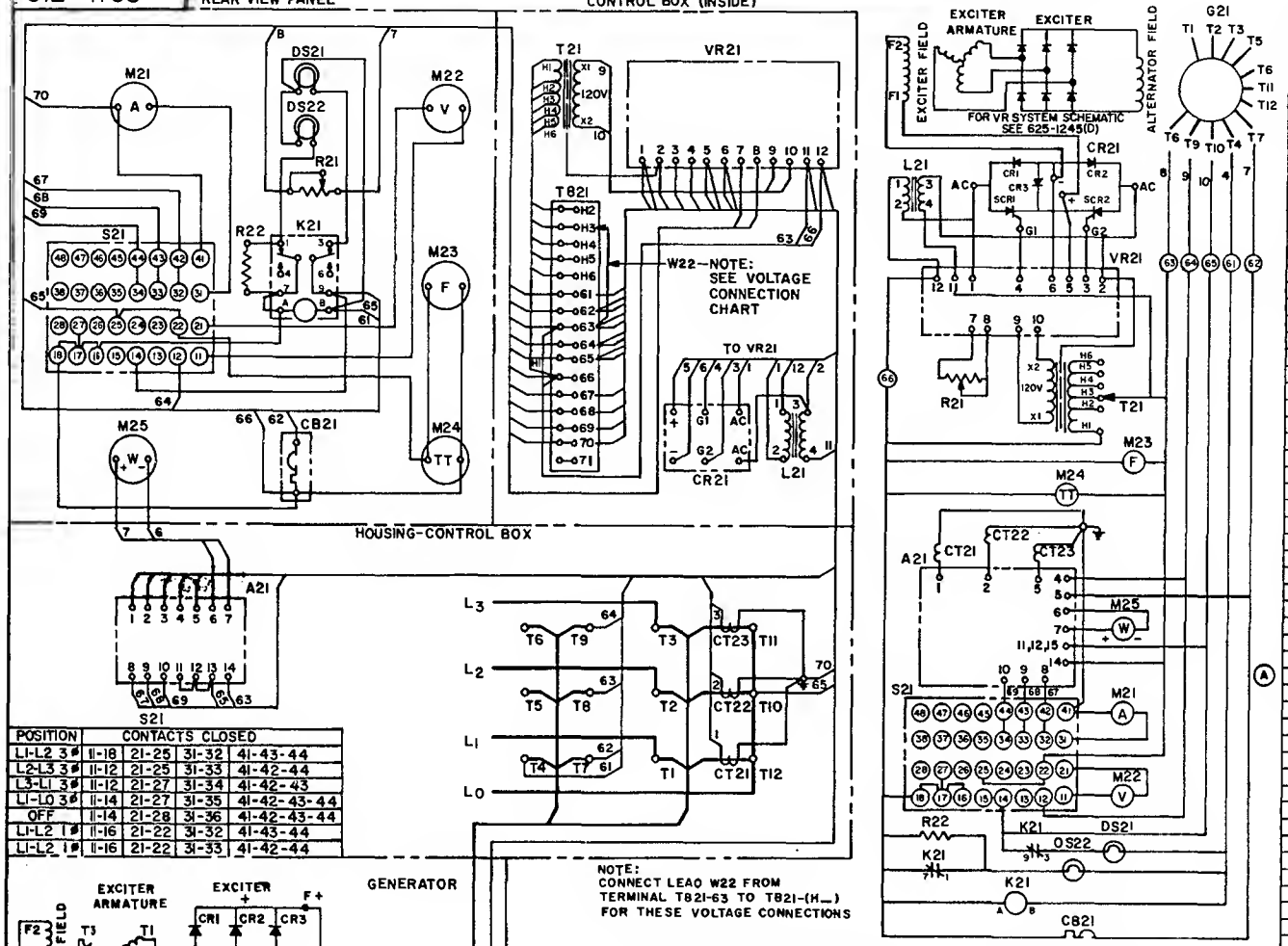
612-4795

WIRING DIAGRAM

REAR VIEW PANEL

CONTROL BOX (INSIDE)

SCHEMATIC DIAGRAM



POSITION	CONTACTS CLOSED			
LI-L2 3Ø	11-18	21-25	31-32	41-43-44
L2-L3 3Ø	11-12	21-25	31-33	41-42-44
L3-LI 3Ø	11-12	21-27	31-34	41-42-43
LI-L0 3Ø	11-14	21-27	31-35	41-42-43-44
OFF	11-14	21-28	31-36	41-42-43-44
LI-L2 1Ø	11-16	21-22	31-32	41-43-44
LI-L2 1Ø	11-16	21-22	31-33	41-42-44

NOTE:
CONNECT LEAD W22 FROM TERMINAL T821-63 TO T821-(H__) FOR THESE VOLTAGE CONNECTIONS

517R	110/190V, 50Hz, (H3) 115/200V, 50Hz, (H4) 120/206V, 50Hz, (H4) 127/220V, 50Hz, (H5)	3PH	220/380V, 50Hz, (H3) 230/400V, 50Hz, (H4) 240/416V, 50Hz, (H4) 254/440V, 50Hz, (H5)	3PH
17R	120/208V, 60Hz, (H3) 127/220V, 60Hz, (H4) 139/240V, 60Hz, (H5)	3PH	240/416V, 60Hz, (H3) 254/440V, 60Hz, (H4) 277/480V, 60Hz, (H5)	3PH

NOTE:
UNLESS OTHERWISE NOTED, ALL COMPONENTS ARE SHOWN IN THE DE-ENERGIZED POSITION

THIS CHART USED FOR MANUFACTURING ONLY

KW	60Hz	50 Hz	PENN 60Hz
200	-01	-05	-09
250	-02	-06	-10
300	-03	-07	-11
350	-04	-08	-12

AC CONTROL PARTS LIST

REF. DES.	PART NO	DWG NO	QTY	DESCRIPTION
A21	302-0921	C	1	WATT TRANSDUCER
CB21	320-0455	B	1	CIRCUIT BREAKER,3AMP
	320-0307	P	1	LOCK-CKT BRKR HANDLE(PENN STATE)
CR21	305-0524	C	1	RECTIFIER BRIDGE
CT21-23	302-0908	B	1	TRANSFORMER ASSY-CUR (200KW)
	302-0909	B	1	TRANSFORMER ASSY-CUR (250KW)
	302-0910	B	1	TRANSFORMER ASSY-CUR (300KW)
	302-0911	B	1	TRANSFORMER ASSY-CUR (350KW)
DS21	322-0131	A	1	LIGHT-UPPER SCALE
OS22	322-0130	A	1	LIGHT-LOWER SCALE
G21			1	GENERATOR
K21	307-1061	B	1	RELAY-VOLTAGE SELECTOR
	301-3244	B	1	BRACKET-RELAY MTG
	307-1157	P	1	SPRING-RELAY HOLDDOWN
L21	315-0384	B	1	REACTOR ASSY COMM
M21	302-0877	B	1	AMMETER-AC,0-400,0-600 (200KW)
	302-0878	B	1	AMMETER-AC,0-500,0-1000 (250KW)
	302-0879	B	1	AMMETER-AC,0-600,0-1200 (300KW)
	302-0880	B	1	AMMETER-AC,0-750,0-1500 (350KW)
M22	302-0718	B	1	VOLTMETER-AC,0-300,0-600
M23	302-0810	B	1	METER-FREQUENCY (60Hz)
	302-0894	B	1	METER-FREQUENCY (50Hz)
M24	302-0466	B	1	METER-RUNNING TIME (60Hz)
	302-0469	B	1	METER-RUNNING TIME (50Hz)
M25	302-0926	P	1	WATTMETER-AC,300KW (200KW)
	302-0927	P	1	WATTMETER-AC,300KW (250KW)
	302-0928	P	1	WATTMETER-AC,500KW (300KW)
	302-0929	P	1	WATTMETER-AC,500KW (350KW)
R21	303-0170	P	1	RHEOSTAT-VOLTAGE ADJ 3.5K 25W
	303-0032	P	1	KNOB-RHEOSTAT
R22	350-0556	(REF)	1	RESISTOR-47000, 1/2 WATT
S21	308-0284	B	1	SWITCH-VOLT & AMMETER
	303-0076	-	1	KNOB
T21	315-0342	D	1	TRANSFORMER-VOLT REF
TB21	332-1242	A	1	MARKER-STRIP
VR21	332-1268	O	1	BOARD ASSY-PC VOLTAGE RGLTR
				612-4795
	338-0730	D	1	WIRING HARNESS
W22	336-1913	A	1	LEAD ASSY
	301-3312	C	1	PANEL-GEN CONTROL
	301-3158	D	1	CONTROL BOX
	402-0070	A	4	DAMPENER-VIBRATION
	337-0049	-	1	STRAP-BOND
	508-0001	P	4	GROMMET-RUBBER
	98-2169	C	1	SILKSCREEN-CONTROL PANEL AC
	545-0023	A	1	PARTS LIST-AC CONT HDW
	232-2246	A	2	JUMPER-BUS BAR
	232-2248	A	3	JUMPER-BUS BAR
	98-2627	C	1	SILKSCREEN-CONTROL PANEL AC(REAR)

LTT	REVISION	CKR	ENGR	DATE
C	WAS 277/460V (H3)		AH	11-2-74
B	WAS 254/440V (H3)		AH	11-2-74
A	WAS W12		AH	11-13-73

PROD REL
MODEL NO
200-350KW-17R/7686
200-350KW-517R/7686
BRUSHLESS
3PH, 50/60Hz
12W RECONNECTABLE

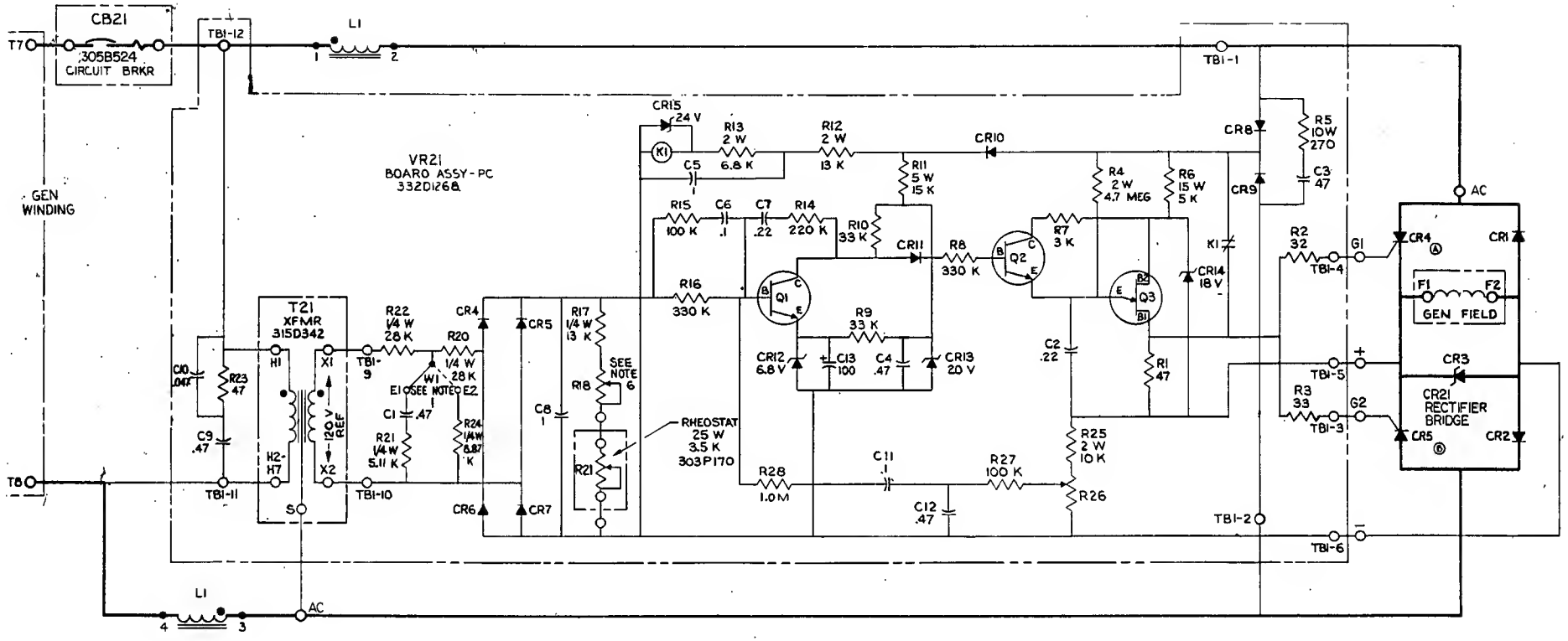
Onan DIVISION OF STUDEBAKER CORPORATION Minneapolis, Minnesota

DATE 7-30-73 CK CIP ENGR SH CKR CDR

NAME CONTROL-GEN SET AC (WIRING DIAGRAM)

DWG. NO. 612-4795

DWG SIZE C



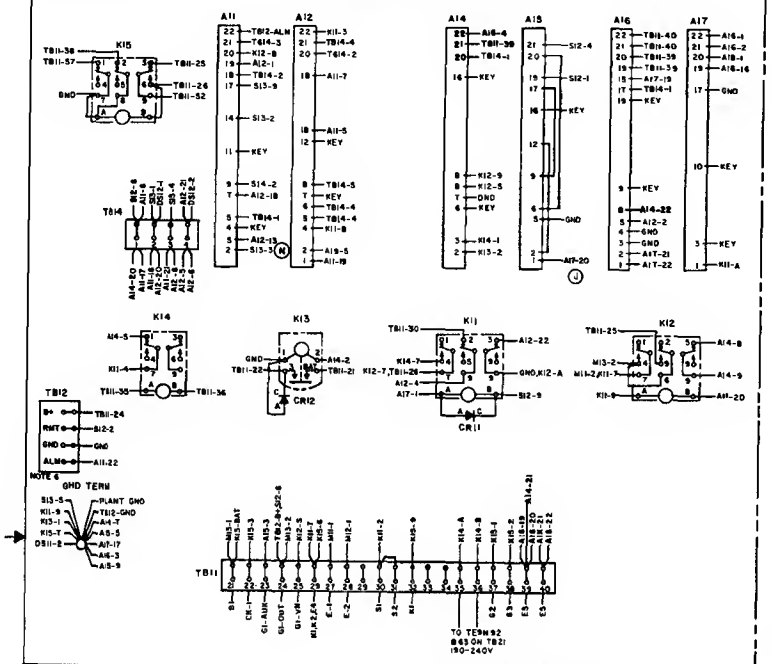
NOTES:

1. NORMAL CONNECTION IS W1 TO E1 FOR VOLTAGE REFERENCE CIRCUIT SENSITIVE TO FREQUENCY. WHEN W1 IS CONNECTED TO E2 VOLTAGE REFERENCE CIRCUIT IS NOT SENSITIVE TO FREQUENCY
2. ALL PART NUMBERS AND VALUES ARE REFERENCE ONLY
3. ALL RESISTORS 1/2 WATT EXCEPT WHERE NOTED
4. ALL CAPACITOR RATING IN MICROFARADS
5. FOR TYPE AND RATING OF SEMI CONDUCTORS, SEE INDIVIDUAL ASSEMBLY MATERIAL LISTS
6. MAXIMUM RESISTANCE 2000 OHMS

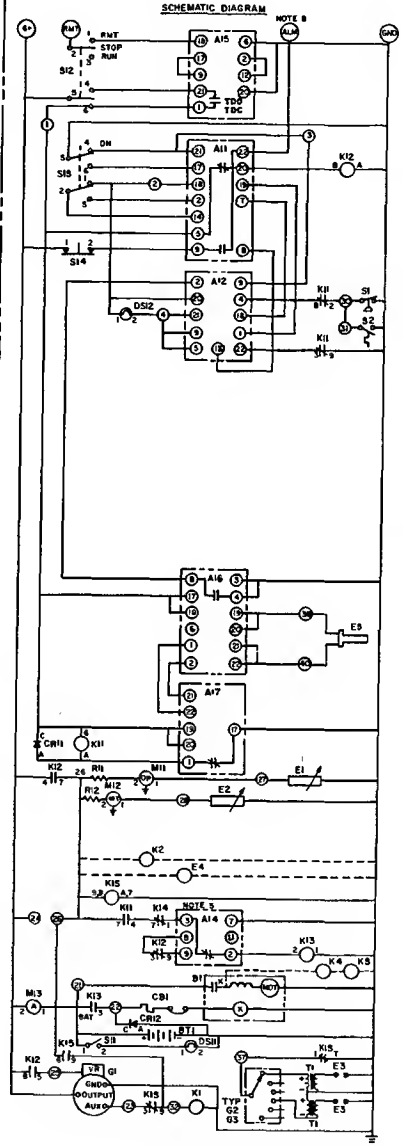
SCHEMATIC DIAG-VR SYS.
625-1245

612-4546 REV D

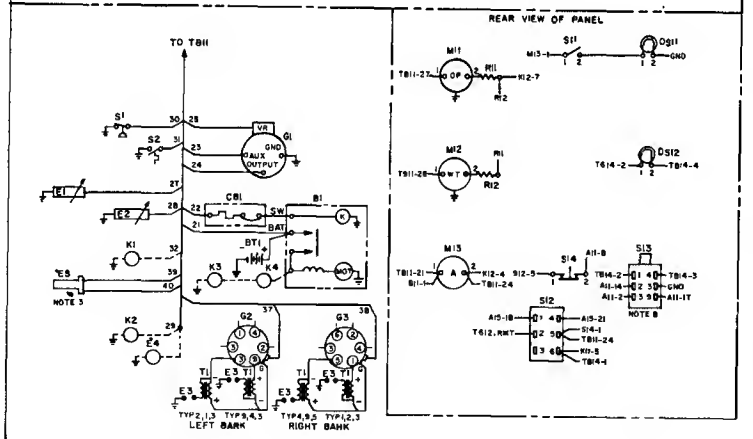
WIRING DIAGRAM



SCHEMATIC DIAGRAM



REAR VIEW OF PANEL



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS. *
2. SHUTDOWN & ALARMS
   2.1 STD CONTROL
   2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   2.2 PENN STATE CONTROL
   2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. (F) MAGNETIC SENSOR (ES) MOUNTED IN GEN END BELL, AIR GAP SETTING .060/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS AI4-2 TO AI4-3 FOR STEADY CRANKING, THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TO
   CAN BE ADJUSTED INDEPENDENTLY
   START---------- 0.5 TO 10 SECONDS
   STOP----------- 0.5 TO 5 MINUTES
   TOLERANCE----- ±20%
8. SI3 MUST BE MOUNTED WITH SOLDER TERM UP
9. (G) STARTER DISCONNECT 310±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90 RPM

ENGINE PARTS LIST (REF)

REF DES	PART NO		QTY	DESCRIPTION
BI			1	STARTER & SOLENOID-ENGINE
BTI			1	BATTERY-24V
CBI	320-0040	P	1	CIRCUIT BREAKER, 12.5 AMP
EI	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0104	A	1	SENDER-WATER TEMP
E3			12	SPARK PLUG
E4			1	FUEL PUMP
(D) E5	150-1406	A	1	SENSOR-SPEED (MAG) (REF)
GI			1	ALTERNATOR & REGULATOR
G2,3			2	MAGNETO
KI			1	SOLENOID-FUEL
K2			1	SOLENOID-WATER
K3,4			2	VALVE-GAS
SI			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
TI			12	COIL-IGNITION

CONTROL BOX PARTS LIST

AII	300-0954	C	1	MODULE-ENGINE SHUTDOWN
AI2	300-0955	C	1	MODULE-ENGINE MONITOR
(M) AI4	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
AI3	300-0987	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
AI6	300-0967	C	1	MODULE-OVERSPEED SEN
AI7	300-0958	C	1	MODULE-STARTER DISC
CRII/I2	597-0004	A	2	DIODE (REF)
(E) DSII	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DSI2	322-0129	A	1	LAMP-FAULT
KII	307-1036	B	1	RELAY-START DISCONNECT
KI2	307-1035	B	1	RELAY-IGNITION
KI3	307-0091	B	1	RELAY-START SOLENOID
KI4	307-1061	B	1	RELAY-STARTER PROTECTION
(H)	307-1157	P	3	SPRING-RELAY HOLDDOWN (KI2,4)
KI5	307-1056	B	1	RELAY-STOP
	323-0668	B	1	SOCKET-ASSY RELAY
	813-0096	-	2	SCREW-RHM 10-32 1/4LG
MII	193-0107	B	1	GAUGE-OIL PRESSURE
MI2	193-0106	B	1	GAUGE-WATER TEMP
MI3	302-0081	A	1	AMMETER-CHARGE 30-0-30
RII,I2	193-0189	P	2	RESISTOR-GAUGE
SII	308-0002	-	1	SWITCH-PANEL LIGHT
SI2	308-0220	P	1	SWITCH-SELECTOR (-01,-03,-05,-07)
	308-0547	A	1	SWITCH-SELECTOR (-02,04,-06,-08)
SI3	308-0337	A	1	SWITCH-LAMP TEST
SI4	308-0091	P	1	SWITCH-ALARM RESET
TBII	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1539	A	1	MARKER STRIP
TDI2,I4	332-2537	A	2	TERMINAL BLOCK
	332-1238	A	1	MARKER STRIP (TDI2)
	332-1561	A	1	MARKER STRIP (TBI4)
	812-0079	-	2	SCREW-RHM 8-32 1/2LG
(C)	338-0718	D	1	WIRING HARNESS
	545-0026	A	1	PARTS LIST-CONT HDW (ENG)
(L)	301-3621	D	1	BRACKET-ENG CONTROL
	301-3661	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8LG
	323-0614	P	12	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01,-03,-05,-07) -08,-10,-11)
	98-2543	B	1	SILKSCREEN (-02,-04,-06,-08)
	98-2545	B	1	SILKSCREEN

THIS INFO FOR MANUFACTURING ONLY

	STD CRANKER BYPASS PLUG	CYCLE CRANKER BYPASS PLUG	STD CRANKER TIME DELAY START STOP	CYCLE CRANKER TIME DELAY START STOP
STD CONTROL	-01	-03	-03	-07
PENN STATE	-02	-04	-06	-08

* WHEN USED

REV	
N	ADDED AII-3 TO AI2-7B
M	AII,0,12,14,16,17 WAS CONTROL
L	WAS 301-3629
K	UPDATED
J	WAS PIN 11
H	307-1157 QTY WAS 4
G	ADDED NOTE 6
F	ADDED AIR GAP SETTING
E	WAS 332-618, 332-715
D	ADDED REF
C	WAS 336-705
B	UPDATED
A	DELETED S3

SUPERSEDES DWG 612C4549 DATED 8-26-75

612-4546

WF-R/IC

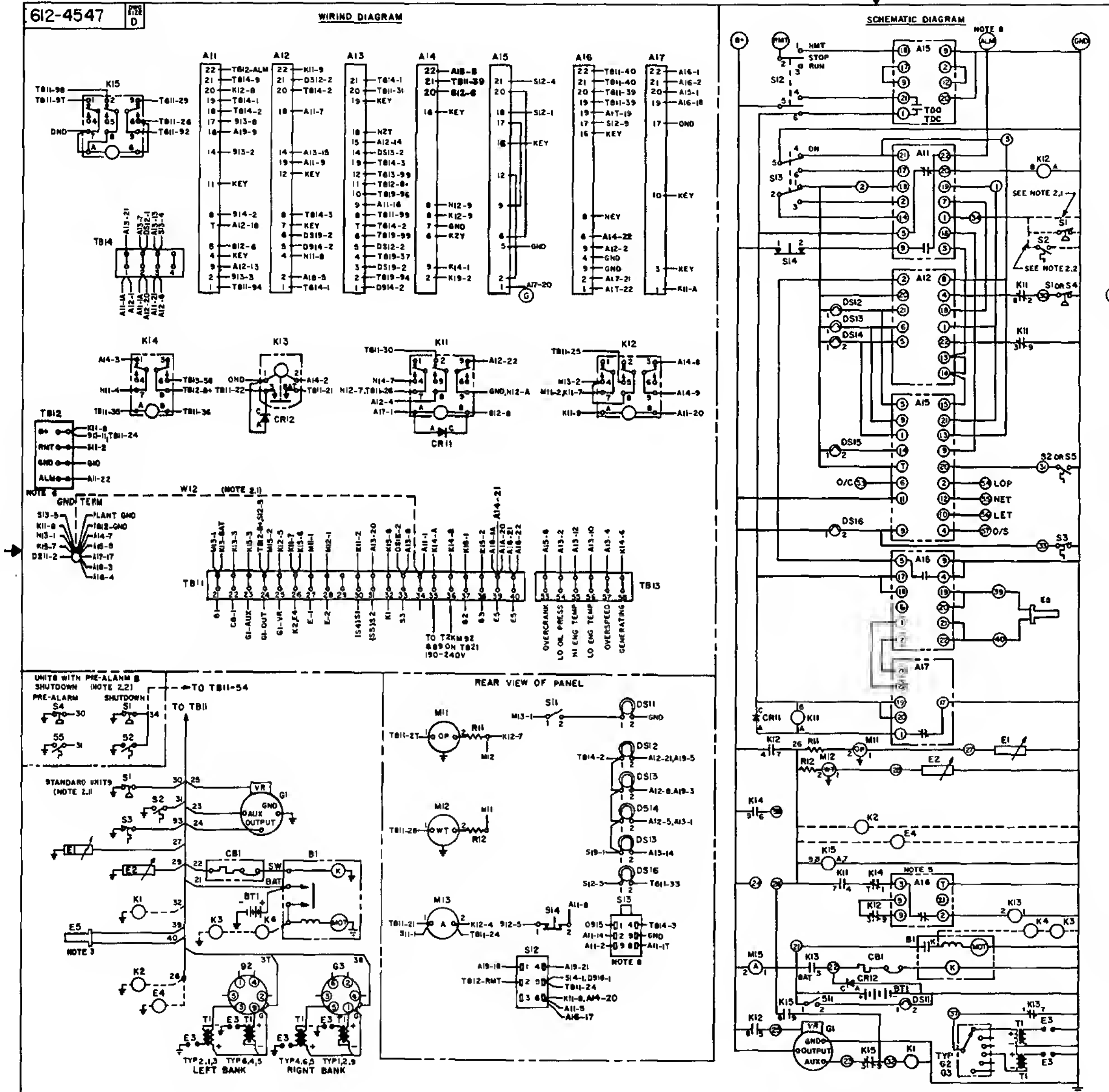
2 WIRE REMOTE STARTING

CONTROL-GEN SET ENG 12V MAG IGN (WIRING DIAGRAM)

612D 612-4546 D

612-4546

612-4547 D



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS.
   - 2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   - 2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR HI ENG TEMP OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.
3. (D) MAGNETIC SENSORS (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD CAN BE ADJUSTED INDEPENDENTLY
   START---------- 0.5 TO 10 SECONDS
   STOP---------- 0.5 TO 5 MINUTES
   TOLERANCE---- ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. (E) STARTER DISCONNECT 510±60RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90RPM

ENGINE PARTS LIST (REF)

REF DES	PART NO	??	QTY	DESCRIPTION
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24 V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0104	A	1	SENDER-WATER TEMP
E3			12	SPARK PLUG
E4			1	FUEL PUMP *
E5	150-1406	A	1	SENSOR-SPEED (MAG) (REF) (B)
G1			1	ALTERNATOR & REGULATOR
G2,9			2	MAGNETO
K1			1	SOLENOID-FUEL *
K2			1	SOLENOID-WATER *
K3,4			2	VALVE-GAS
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
S3			1	SWITCH-LOW WATER TEMP
S4			1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S5			1	SWITCH-HI WATER TEMP (PRE-ALARM)
T1			12	COIL-IGNITION

CONTROL BOX PARTS LIST

REF DES	PART NO	??	QTY	DESCRIPTION
A11	300-0954	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0953	C	1	MODULE-ENGINE MONITOR
A15	300-0955	C	1	MODULE-REMOTE INDICATOR
A14 (J)	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
A15	300-0967	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
DS11 (C)	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0119	A	1	LAMP-OVERCRANK
DS13	322-0125	A	1	LAMP-OVERSPEED
DS14	322-0120	A	1	LAMP-LOW OIL PRESS
DS15	322-0121	A	1	LAMP-HI ENG TEMP
DS16	322-0122	A	1	LAMP-LO ENG TEMP
K11	307-1056	B	1	RELAY-START DISCONNECT
K12	307-1036	B	1	RELAY-IGNITION
K13	307-0061	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
(F)	307-1157	P	5	SPRING-RELAY HOLDDOWN (K11,12,14)
K15	307-1056	B	1	RELAY-STOP
	323-0868	B	1	SOCKET-ASSY RELAY
	813-0096	-	2	SCREW-RHM 10-32 1/4 LG
M11	193-0107	B	1	GAUGE-OIL PRESSURE
M12	193-0106	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	193-0189	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01,-02,-04,-05, -07,-08,-10,-11)
	308-0347	A	1	SWITCH-SELECTOR (-03,-06,-09,-12)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0091	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1559	A	1	MARKER STRIP
TB12,14	332-537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1361	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
TB13	332-0669	A	1	TERMINAL BLOCK
	332-0506	A	1	MARKER STRIP
	338-0705	D	1	WIRING HARNESS
W12	336-1918	A	1	LEAD ASSY (STD CONT ONLY)
	545-0026	A	1	PARTS LIST-CONT HDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
	301-3629	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8 LG
	325-0814	P	14	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01,-02,-04,-05,-07, -08,-10,-11)
	98-2543	B	1	SILKSCREEN (-03,-06,-09,-12)
	98-2544	B	1	SILKSCREEN

* WHEN USED

THIS INFO FOR MANUFACTURING ONLY

	STD CRANKER	CYCLE CRANKER	STD CRANKER	CYCLE CRANKER
	BYPASS PLUG	BYPASS PLUG	TIME DELAY START STOP	TIME DELAY START STOP
STD CONTROL	-01	-04	-07	-10
PRE-ALARM	-02	-05	-08	-11
PENN STATE	-03	-06	-09	-12

LET	REVISION
J	A11,12,13,14,16,17 WAS CONTROL
H	UPDATED
G	WAS PIN 11
F	307-1157 QTY WAS 4
E	ADDED NOTE 9
D	ADDED AIR GAP SETTING
C	WAS 332-919 3-22-73
B	ADDED REF
A	UPDATED

SUPERSEDES DWG 612C4547 DATED 12-6-71

Onan

DATE 2-8-73 | CIP

WF-R/9222C

CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM)

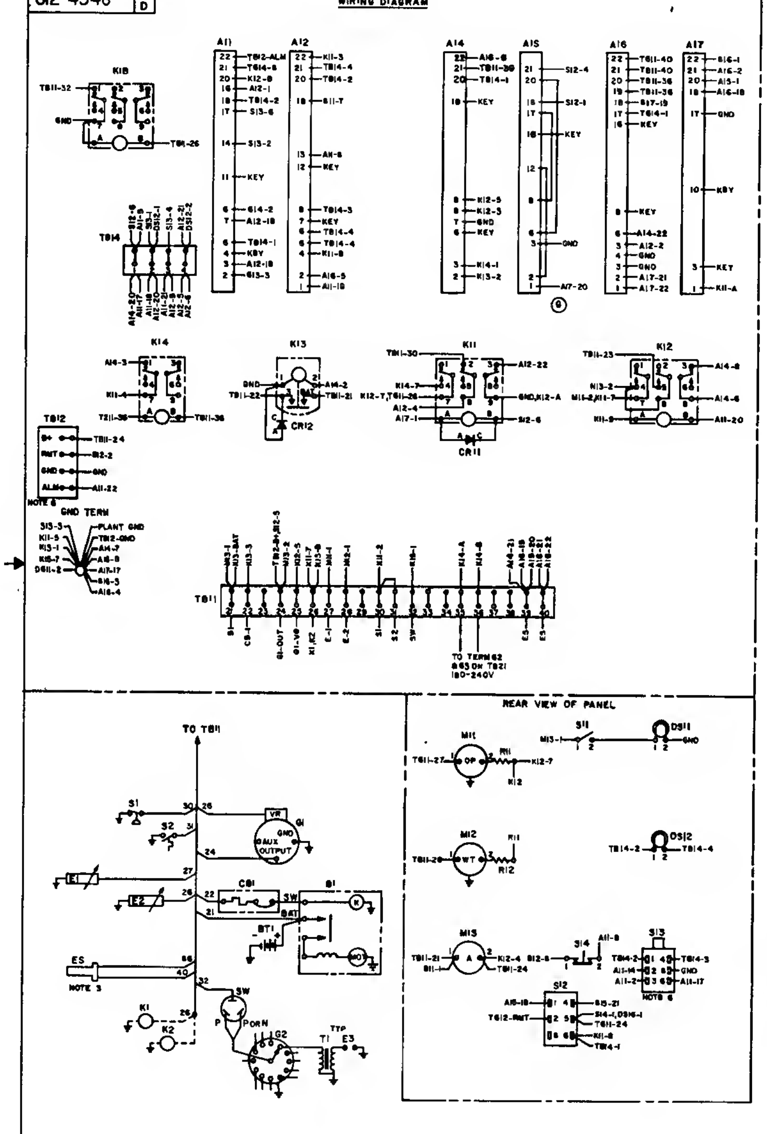
2 WIRE REMOTE STARTING

612D | 612-4547 | D

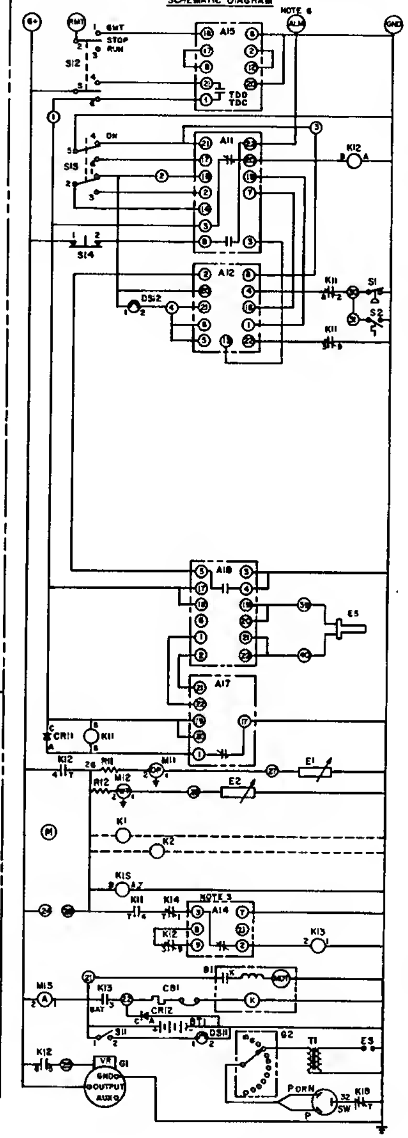
612-4547

612-4548 D

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. (E) MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.060.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START---------- 0.5 TO 10 SECONDS
   STOP---------- 0.5 TO 5 MINUTES
   TOLERANCE---- ±20%
8. 615 MUST BE MOUNTED WITH SOLDER TERM UP
9. (F) STARTER DISCONNECT 510±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90RPM

REF DES	PART NO	??	QTY	DESCRIPTION
ENGINE PARTS LIST (REF)				
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24 V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0104	A	1	SENDER-WATER TEMP
E3			12	SPARK PLUG
(C) E5	130-1406	A	1	SENSOR-SPEED (MAG) (REF)
G1			1	ALTERNATOR & REGULATOR
G2			1	MAGNETO & IGNITION ISOLATOR
* K1			1	SOLENOID-FUEL
* K2			1	SOLENOID-WATER
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
T1			12	COIL-IGNITION
CONTROL BOX PARTS LIST				
A11	300-0954	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0963	C	1	MODULE-ENGINE MONITOR
(L) A14	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
A15	300-0987	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
(D) DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0129	A	1	LAMP-FAULT
K11	307-1058	B	1	RELAY-START DISCONNECT
K12	307-1056	B	1	RELAY-IGNITION
K13	307-0061	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
(G)	307-1157	P	3	SPRING-RELAY HOLDDOWN (K11,12,14)
K15	307-1056	B	1	RELAY-STOP
	323-0871	B	1	SOCKET-ASSY RELAY
	813-0096	-	2	SCREW-RHM 10-32 1/4 LG
M11	193-0107	B	1	GAUGE-OIL PRESSURE
M12	193-0106	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	193-0109	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01,-03,-05,-07)
	308-0347	A	1	SWITCH-SELECTOR (-02,-04,-06,-08)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0091	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF
	332-1559	A	1	MARKER STRIP
TB12,14	332-0537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1561	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
(J)	338-0715	D	1	WIRING HARNESS
	545-0026	A	1	PARTS LIST-CONT HDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
(K)	301-3881	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3633	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8LG
	323-0814	P	12	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01,-03,-05,-07)
	98-2543	B	1	SILKSCREEN (-02,-04,-06,-08)
	98-2543	B	1	SILKSCREEN

* WHEN USED

THIS INFO FOR MANUFACTURING ONLY

	STD CRANKER BYPASS PLUG	CYCLE CRANKER BYPASS PLUG	STD CRANKER TIME DELAY START STOP	CYCLE CRANKER TIME DELAY START STOP
STD CONTROL	-01	-03	-05	-07
PENN STATE	-02	-04	-06	-08

LTR	REVISION	DATE
N	REM N14 [illegible]	1-16-[illegible]
L	A11,12,13,14,16,17 WAS CONTROL	[illegible]
K	WAS 301-3621	11-[illegible]
J	UPDATED	10-73
H	WAS PM 11	9-73
G	307-1157 QTY WAS 4	8-73
F	ADDED NOTE 9	8-73
E	ADDED AIR GAP SETTING	8-73
D	WAS 332-818 & 332-73	8-73
C	ADDED REF	[illegible]
B	WAS 338-705	3-31-73
A	UPDATED	7-13-72

SUPERSEDES DWG 612C4548 DATED 1-5-72

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

MODEL: FT-R/IC

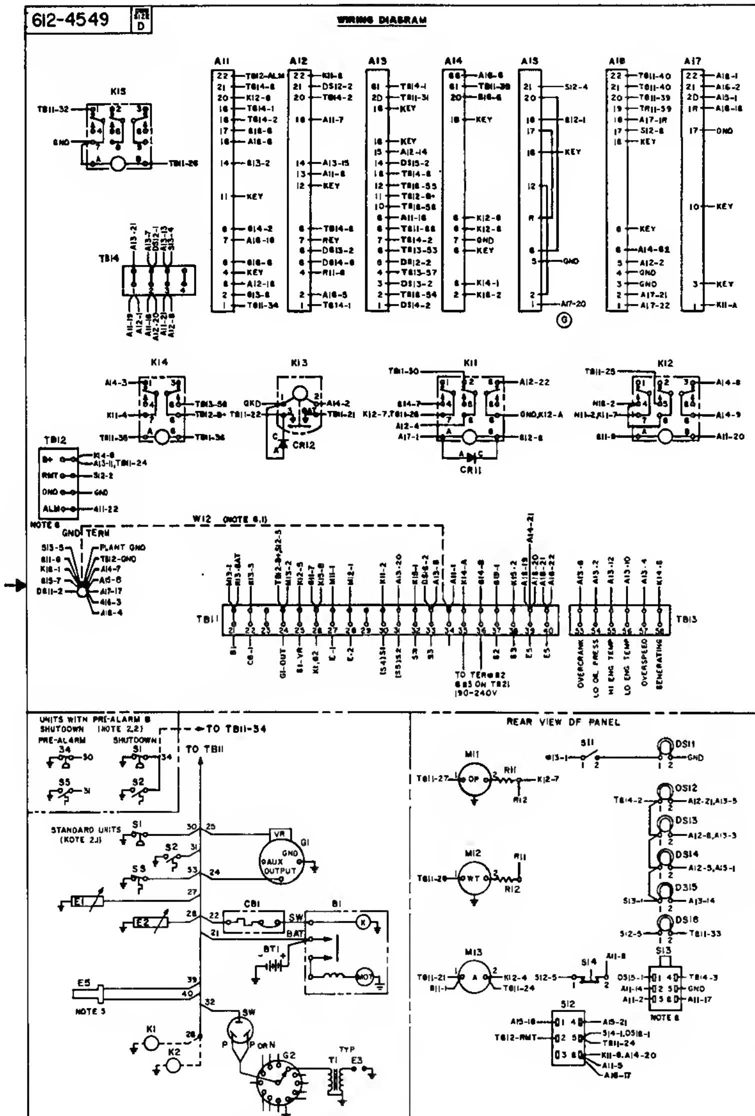
2 WIRE REMOTE STARTING

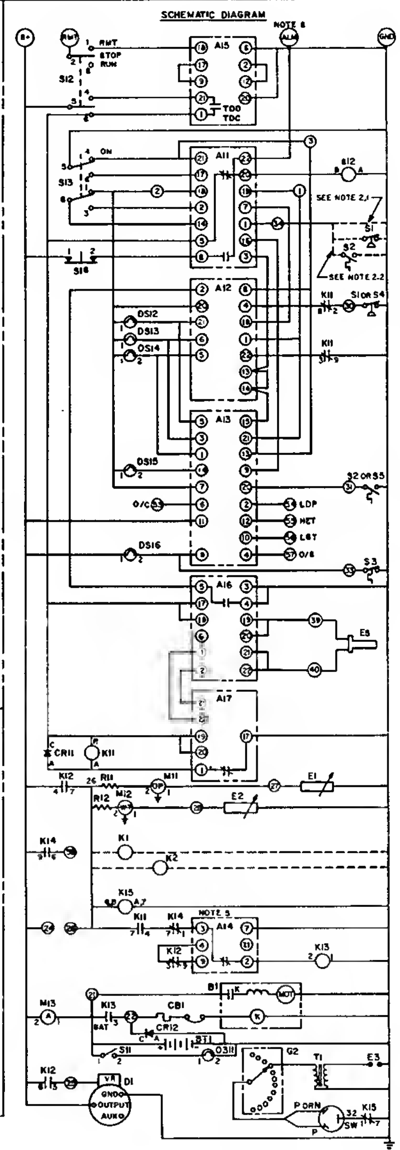
DATE 2-27-73 DR CIP

CONTROL-GEN SET ENG (24V MAG IGN) (WIRING DIAGRAM)

612D — DWG NO 612-4548 — SIZE D

612-4548





NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.

2. SHUTDOWNS AND ALARMS.
   2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.

(D) 3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050

4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.

5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.

6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX

7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START---------- 0.5 TO 10 SECONDS
   STOP---------- 0.5 TO 5 MINUTES
   TOLERANCE---- ±20%

8. S13 MUST BE MOUNTED WITH SOLDER TERM UP

(E) 9. ~~STARTER DISCONNECT [illegible]~~
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100± 90RPM

REF DES	PART NO		QTY	DESCRIPTION
				ENGINE PARTS LIST (REF)
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0104	A	1	SENDER-WATER TEMP
E3			12	SPARK PLUG
E5	150-1406	A	1	SENSOR-SPEED (MAG) (REF)
G1			1	ALTERNATOR & REGULATOR
G2			1	MAGNETO & IGNITION ISOLATOR
K1			1	SOLENOID-FUEL
K2			1	SOLENOID-WATER
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
S3			1	SWITCH-LOW WATER TEMP
S4			1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S5			1	SWITCH-HI WATER TEMP (PRE-ALARM)
T1			12	COIL-IGNITION
				CONTROL BOX PARTS LIST
A11	300-0954	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0953	C	1	MODULE-ENGINE MONITOR
A13	300-0955	C	1	MODULE-REMOTE INDICATOR
A14	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
A15	300-0967	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0119	A	1	LAMP-OVERCRANK
DS13	322-0123	A	1	LAMP-OVERSPEED
DS14	322-0120	A	1	LAMP-LOW OIL PRESS
DS15	322-0121	A	1	LAMP-HI ENG TEMP
DS16	322-0122	A	1	LAMP-LO ENG TEMP
K11	307-1058	B	1	RELAY-START DISCONNECT
K12	307-1056	B	1	RELAY-IGNITION
K13	307-0061	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
	307-1157	P	3	SPRING-RELAY HOLDDOWN (K11,12,14,15)
K15	307-1066	B	1	RELAY-STOP
	323-0871	B	1	SOCKET-ASSY RELAY
	813-0096	-	2	SCREW-RHM 10-32 1/4 LG
M11	193-0107	B	1	GAUGE-OIL PRESSURE
M12	193-0106	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	193-0169	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01,-02,-04,-05,
				-07,-08,-10,-11)
	308-0347	A	1	SWITCH-SELECTOR (-03,-06,-09,-12)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0091	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1559	A	1	MARKER STRIP
TB12,14	332-0537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1561	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
TB13	332-0599	A	1	TERMINAL BLOCK (REF)
	332-1560	A	1	MARKER STRIP
	338-0705	D	1	WIRING HARNESS
W12	336-1918	A	1	LEAD ASSY (STD CONT ONLY)
	545-0028	A	1	PARTS LIST-CONT HDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
	301-3629	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8 LG
	323-0814	P	14	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01,-02,-04,-05,-07,
				-08,-10,-11)
	98-2543	B	1	SILKSCREEN (-03,-06,-09,-12)
	98-2544	B	1	SILKSCREEN

\# WHEN USED

THIS INFO FOR MANUFACTURING ONLY

	STD CRANKER	CYCLE CRANKER	STD CRANKER	CYCLE CRANKER
	BYPASS PLUG	BYPASS PLUG	TIME DELAY START STOP	TIME DELAY START STOP
STD CONTROL	-01	-04	-07	-10
PRE-ALARM	-02	-05	-08	-11
PENN STATE	-03	-06	-09	-12

LET	REVISION
J	A11,12,13,14,16,17 WAS C&N T [illegible]
H	[illegible]
G	[illegible]
F	[illegible] 4
E	[illegible]
D	[illegible]
C	[illegible]
B	[illegible]
A	UPDATED

SUPERSEDES DWG 612C4549 DATED 12-8-71

Onan

2-28-73 CIP

CONTROL-GEN SET EMG (24V MAD IGN) (WIRING DIAGRAM)

FT-R/9222C

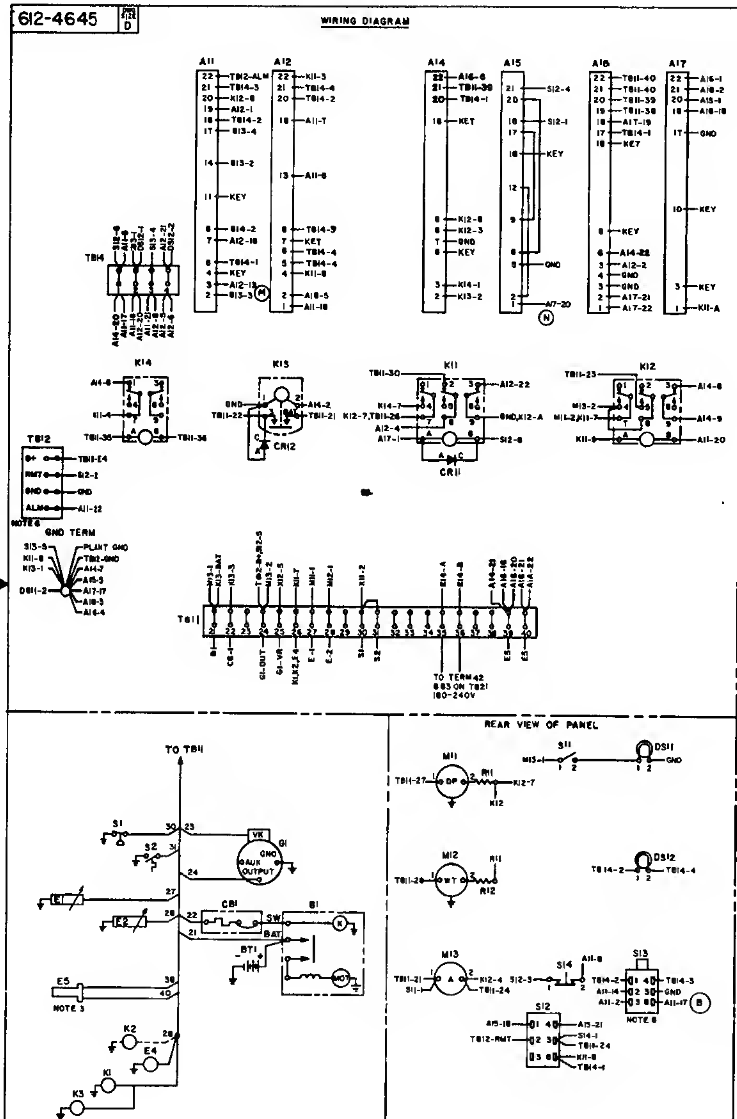
2 WIRE REMOTE STARTING

6120 612-4549 D

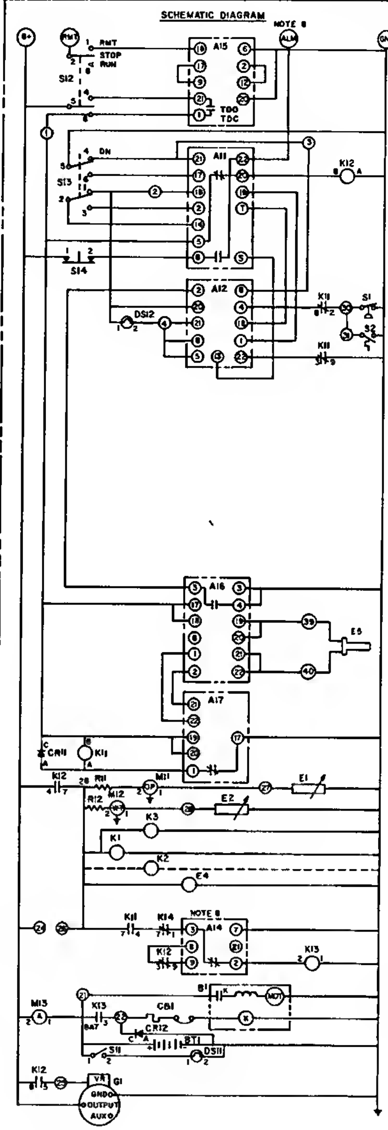
612-4549

612-4645 D

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   - 2.1 STD CONTROL
   - 2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK, OVERSPEED, HI ENG TEMP & LO OIL PRESS
   - 2.2 PENN STATE CONTROL
   - 2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   - 2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. (F) MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .080/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD CAN BE ADJUSTED INDEPENDENTLY
   START---------0.5 TO 10 SECONDS
   STOP----------0.5 TO 5 MINUTES
   TOLERANCE----±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. (B) STARTER DISCONNECT 810±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90 RPM

REF DES	PART NO	SIZE	QTY	DESCRIPTION
ENGINE PARTS LIST (REF)				
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0109	A	1	SENDER-WATER TEMP
E4			1	FUEL PUMP
(D) E5	150-1406	A	1	SENSOR-SPEED (MAG) (REF)
G1			1	ALTERNATOR & REGULATOR
K1			1	SOLENOID-ENG STOPPING
* K2			1	SOLENOID-WATER
K3			1	SOL-ENG STOPPING (DYB, DYH ONLY)
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
CONTROL BOX PARTS LIST				
A11	300-0954	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0953	C	1	MODULE-ENGINE MONITOR
(L) A14	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0966	C	1	MODULE-CYCLE CRANKER
A15	300-0967	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
(E) DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0129	A	1	LAMP-FAULT
K11	307-1058	B	1	RELAY-START DISCONNECT
K12	307-1056	B	1	RELAY-IGNITION
K13	307-0061	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
	307-1157	P	3	SPRING-RELAY HOLDDOWN (K11,12,14)
(J) M11	193-0194	B	1	GAUGE-OIL PRESSURE (-09 TO-16)
	193-0107	B	1	GAUGE-OIL PRESSURE (-01 TO-08)
M12	193-0106	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
(A) R11,12	193-0189	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01,-03, U5,-07 -09,-10,-11,-12)
	308-0347	A	1	SWITCH-SELECTOR (PENN STATE)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0091	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1559	A	1	MARKER STRIP
TB12,14	332-0537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1561	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
	338-0715	D	1	WIRING HARNESS
	545-0026	A	1	PARTS LIST-CONT NDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
	301-3661	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8LG
	323-0814	P	12	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01,-03,-05,-07,-09, -10,-11,-12)
	98-2543	B	1	SILKSCREEN (PENN STATE ONLY)
	98-2545	B	1	SILKSCREEN

* WHEN USED

THIS INFO FOR MANUFACTURING ONLY

		STD CRANKER BYPASS PLUG	CYCLE CRANKER BYPASS PLUG	STD CRANKER TIME DELAY START STOP	CYCLE CRANKER TIME DELAY START STOP
DYH	STD CONTROL	-01	-03	-05	-07
DYB	PENN STATE	-02	-04	-06	-08
DFT	STD CONTROL	-09	-10	-11	-12
DFU	PENN STATE	-13	-14	-15	-16

LTR	REVISION	DATE
M	ADDED A11-3 TO A12-13	1-10-[illegible]
L	A11,12,14,16,17 WAS CONTROL	[illegible]
K	[illegible] ADDED [illegible] PARTS LIST	[illegible]
J	193-0139 ADDED	[illegible]
H	WAS [illegible] 11	[illegible]
G	ADDED NOTE 9	
F	ADDED AIR GAP SETTING	
E	WAS [illegible] & 338-73	
D	ADDED REF	[illegible]
C	UPDATED	7-13-73
B	WAS A11-7	2-21-73
A	ADDED 193P189 QTY 2	2-9-73

Onan — DIVISION OF ONAN CORPORATION, Minneapolis, Minnesota

DATE 1-31-73 DR CIP

CONTROL-GEN SET ENG (24V DIESEL) (WIRING DIAGRAM)

DYH-R/1B
DYB-R/1C
DFT-R/1D
DFU-R/1E

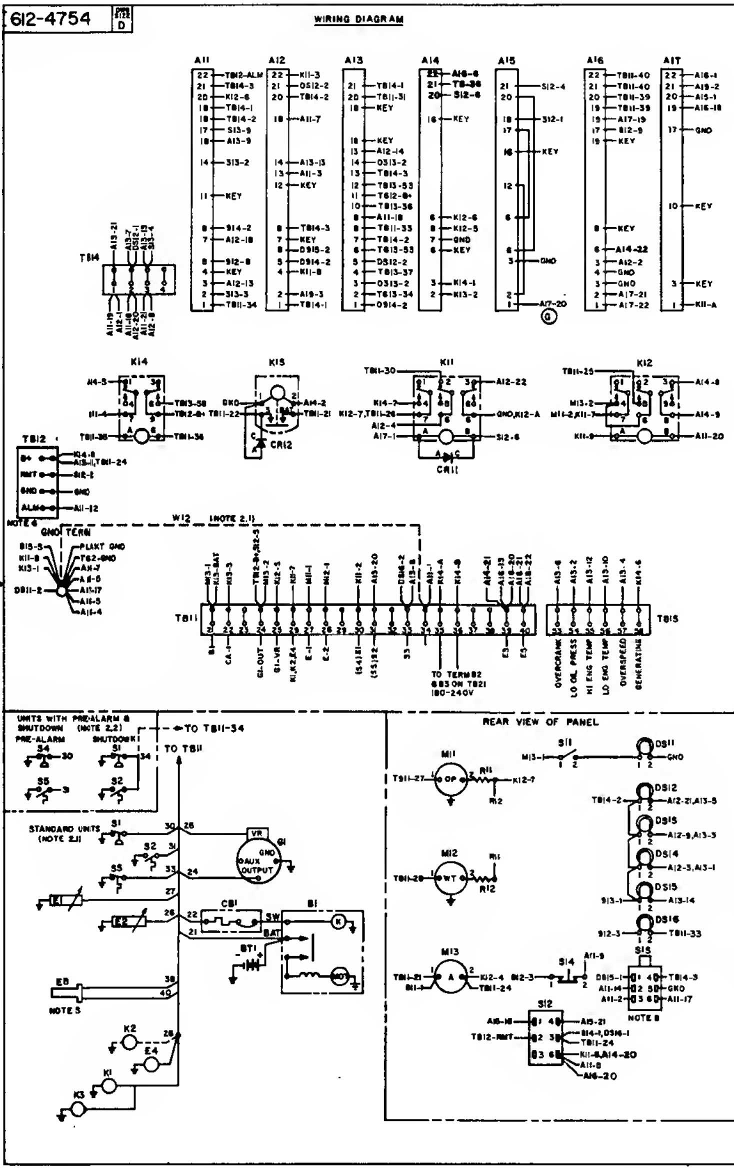
2 WIRE REMOTE STARTING

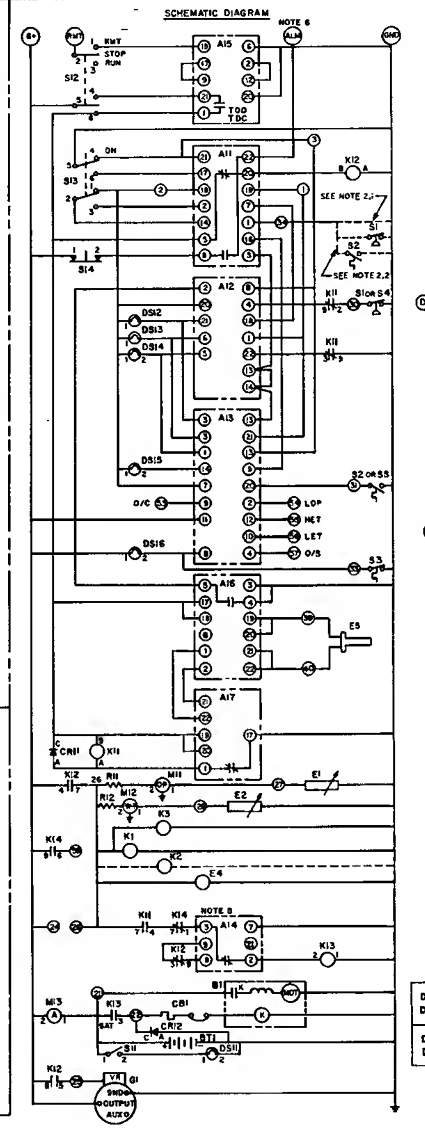
SEPIA FROM 612D — DWG NO 612-4645 — SIZE D

612-4645

612-4645

612-4754 D





NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS,
   2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5.
   2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR HI ENG TEMP, OR LO OIL PRESS, FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP, REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5.
3. MAGNETIC SENSOR (E5) MOUNTED IN GEN END BELL. AIR GAP SETTING .060/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOW IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD CAN BE ADJUSTED INDEPENDENTLY
   START---------- 0.8 TO 10 SECONDS
   STOP---------- 0.5 TO 5 MINUTES
   TOLERANCE---- ±20%
8. S15 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90 RPM

REF DES	PART NO	??	QTY	DESCRIPTION
ENGINE PARTS LIST (REF)				
S1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.3 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0109	A	1	SENDER-WATER TEMP
E4			1	FUEL PUMP
E5	150-1406	A	1	SENSOR-SPEED (MAG) (REF)
G1			1	ALTERNATOR & REGULATOR
K1			1	SOLENOID-ENG STOPPING
K2			1	SOLENOID-WATER
K3			1	SOL-ENG STOPPING (DYB, DYH ONLY)
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
S3			1	SWITCH-LOW WATER TEMP
S4			1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S5			1	SWITCH-HI WATER TEMP (PRE-ALARM)
CONTROL BOX PARTS LIST				
A11	300-0954	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0953	C	1	MODULE-ENGINE MONITOR
A13	300-0955	C	1	MODULE-REMOTE INDICATOR
A14	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
A15	300-0987	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0119	A	1	LAMP-OVERCRANK
DS13	322-0123	A	1	LAMP-OVERSPEED
DS14	322-0120	A	1	LAMP-LOW OIL PRESS
DS15	322-0121	A	1	LAMP-HI ENG TEMP
DS16	322-0122	A	1	LAMP-LO ENG TEMP
K11	307-1038	B	1	RELAY-START DISCONNECT
K12	307-1056	B	1	RELAY-IGNITION
K13	307-0081	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
	307-1157	P	3	SPRING-RELAY HOLDDOWN (K11,12,14)
M11	193-0154	B	1	GAUGE OIL PRESSURE (-13 TO -24)
	193-0107	B	1	GAUGE-OIL PRESSURE (-01 TO -12)
M12	193-0106	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	193-189	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01, -02, -04, -05, -07, -08, -10, -11, -13, -14, -15, -16, -17, -18, -19, -20
	308-0347	A	1	SWITCH-SELECTOR (PENN ST/ATE)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0091	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1559	A	1	MARKER STRIP
TB12,14	332-0537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1561	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
TB13	332-0889	A	1	TERMINAL BLOCK (REF)
	332-1560	A	1	MARKER STRIP
	338-0705	D	1	WIRING HARNESS
W12	336-1918	A	1	LEAD ASSY (STD CONT ONLY)
	545-0026	A	1	PARTS LIST-CONT HDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
	301-3629	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8LG
	323-0814	P	14	GUIDE-PC BD
	98-2542	B	1	SILKSCREEN (-01, -02, -04, -05, -07, -08, -10, -11, -13, -14, -15, -16, -17, -18, -19, -20
	98-2543	B	1	SILKSCREEN (PENN STATE)
	98-2544	B	1	SILKSCREEN

* WHEN USED

THIS INFO FOR MANUFACTURING ONLY

		STD CRANKER	CYCLE CRANKER	STD CRANKER	CYCLE CRANKER
		BYPASS PLUG	BYPASS PLUG	TIME DELAY START STOP	TIME DELAY START STOP
DYH DYB	STD CONTROL	-01	-04	-07	-10
	PRE-ALARM	-02	-05	-08	-11
	PENN STATE	-03	-06	-09	-12
DFT DFU	STD CONTROL	-13	-14	-15	-16
	PRE-ALARM	-17	-18	-19	-20
	PENN STATE	-21	-22	-23	-24

K A11,12,13,14,16,17 WAS CONTROL
A UPDATED

Onan — DIVISION OF ONAN CORPORATION

DYH-R/9222B
DYB-R/9222C
DFT-R/9222D
DFU-R/9222E

2-22-73 CIP

CONTROL-GEN SET ENG (24V DIESEL) (WIRING DIAGRAM)

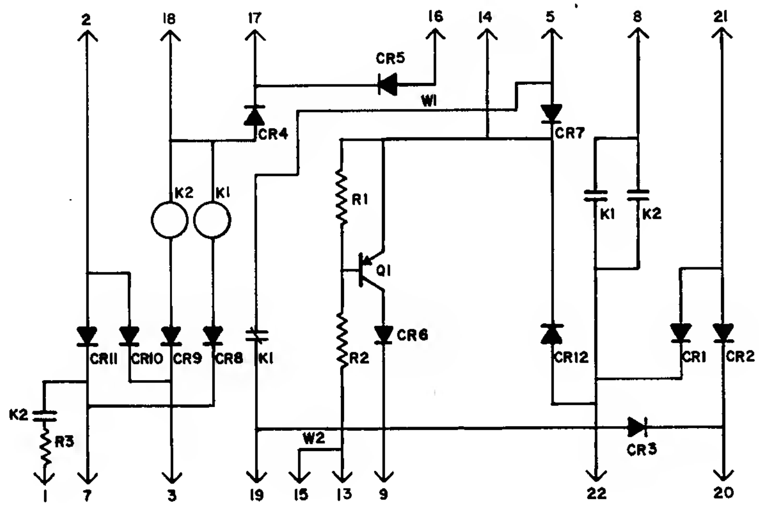
2 WIRE REMOTE STARTING

612D 612-4754 D

300-964

LTR	REVISIONS	ZONE	SHG	CKR	DATE
A	REVISED PER NEW MODEL (WAS TURBINE)	1A	DH	WB	9-23-74

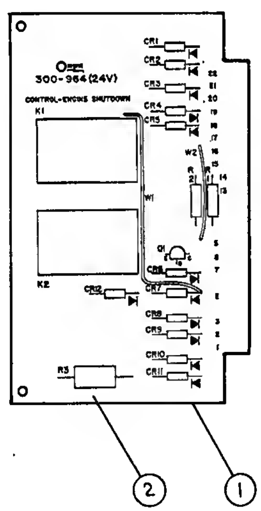
SCHEMATIC DIAGRAM



NOTES:

1. USE GOOD COMMERCIAL SOLDERING PROCEDURES WITH SN63/37 SOLDER.
2. SOLDER JOINTS AND/OR COMPONENT LEADS (EXCEPT POTENTIOMETER LEADS) SHALL NOT PROJECT MORE THAN 3/16" BEYOND SURFACE OF BOARD.
3. TEST AND CALIBRATE PER DWG. NO. 539-0206 (B)

MECHANICAL ASSY



SPECIFICATIONS

REF. DES.	ITEM	PART NO.	DWG SIZE	QTY	DESCRIPTION OR MATERIAL
W1, W2	10	898-0805	P	5.0"	SLEEVING
W1, W2	9	334-0742	A	5.0"	WIRE NO.20
Q1	8	362-0026	A	1	TRANSISTOR-PNP (6533)
R3	7	350-1128	—	1	RESISTOR 220 Ω 10%, 2W
R2	6	350-0545	-	1	RESISTOR-5600 Ω 10%, 1/2W
R1	5	350-0548	-	1	RESISTOR-10,000 Ω 10%, 1/2W
K1, K2	4	307-1076	A	2	RELAY
CR1-CR12	3	357-0004	A	12	RECTIFIER-DIODE
	2	98-2515	D	1	SILKSCREEN-PC BD
	1	332-1528	D	1	PRINTED CIRCUIT BOARD

NEXT ASSY	SIMILAR TO
	300-963
612-5048	300-960
612-5049	300-954

TOLERANCES UNLESS OTHERWISE SPECIFIED
FRACTIONS ± | DECIMALS
ANGLES...± | 2 PLACE ±
HOLES....+.006 −.002 | 3 PLACE ±

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DR Bushard
CKR CDR

Onan
DIVISION OF ONAN CORPORATION
Minneapolis, Minnesota

CONTROL-ENG SHUTDOWN

SCALE NONE

DHA (A) 300-964 DWG SIZE C

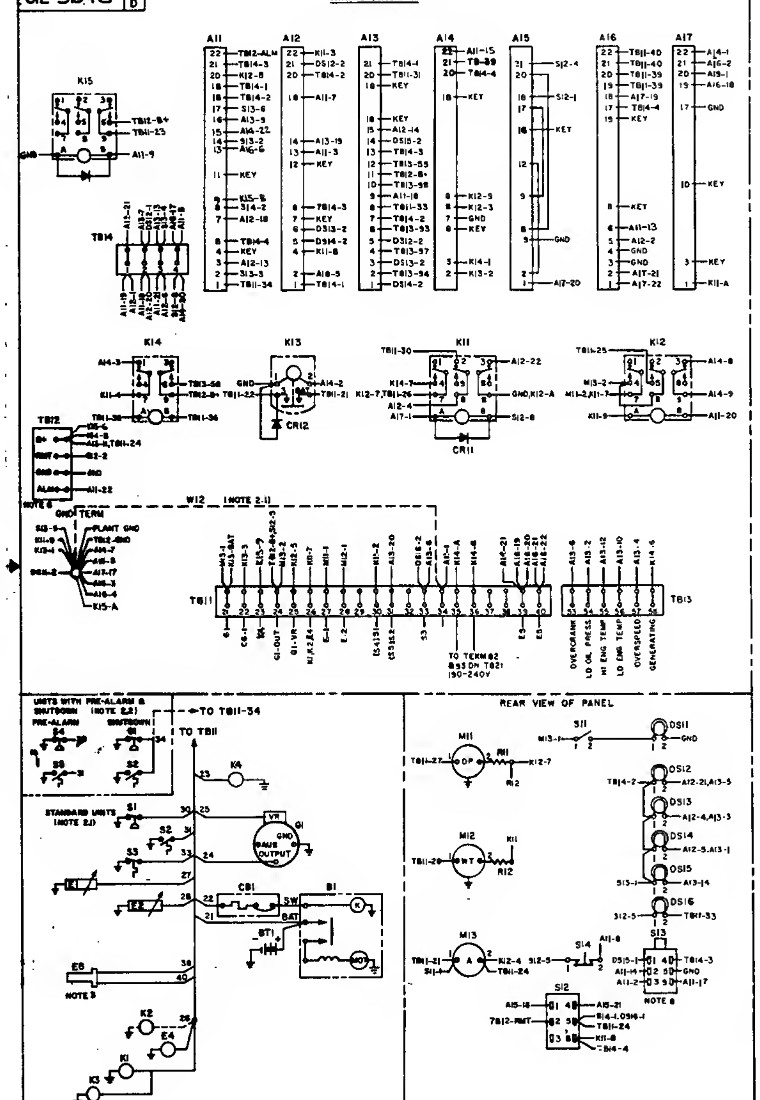
300-964

300-964

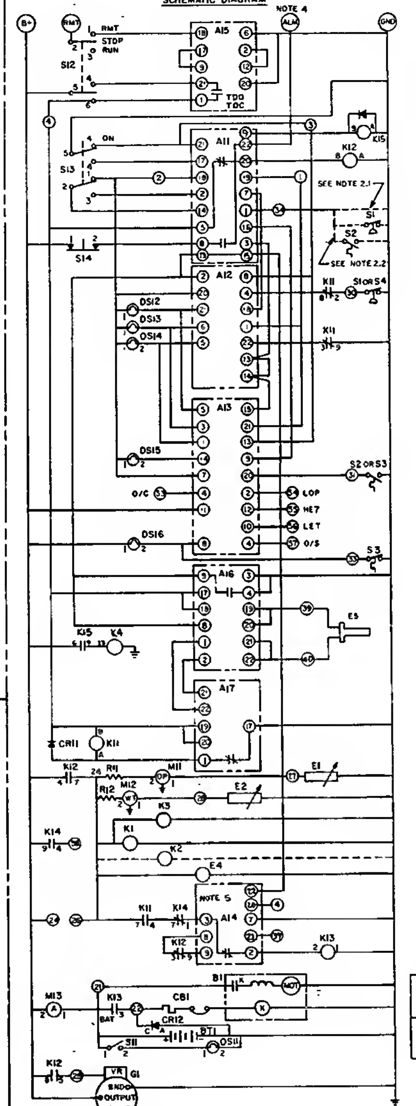
SEPIA FROM MASTER

Rev. 7-75

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWNS AND ALARMS.
   - 2.1 THE STANDARD 5 LIGHT ENGINE MONITOR STOPS ENGINE, CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR OVERCRANK, OVERSPEED, HI ENG TEMP AND LO OIL PRESS. IT LIGHTS THE LAMP ONLY FOR LO ENG TEMP. WIRE W12 MUST CONNECT TB11-34 TO GND. REQUIRES SENSORS S1, S2, S3 AND E5. *
   - 2.2 THE SPECIAL PRE-ALARM 5 LIGHT MONITOR STOPS ENGINE, CLOSES ALARM CONTACT, AND LIGHTS LAMPS FOR OVERCRANK OR OVERSPEED. IT CLOSES ALARM CONTACT AND LIGHTS LAMPS FOR HI ENG TEMP. OR LO OIL PRESS. FOR A PRE-ALARM THEN STOPS ENGINE IF CONDITION GETS WORSE. IT LIGHTS ALARM LAMP ONLY FOR A LO ENG TEMP. REQUIRES SENSORS S1, S2, S3, S4, S5 AND E5. (WIRE W12 NOT REQUIRED THIS CONNECTION)
3. MAGNETIC SENSORS (E5) MOUNTED IN GEN. BELL. GAP SETTING .060/.050
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOW IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A14-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START---------0.5 TO 10 SECONDS
   STOP---------0.5 TO 5 MINUTES
   TOLERANCE---- ±20%
8. S13 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510±60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100±90 RPM

ENGINE PARTS LIST (REF)

REF DES	PART NO		QTY	DESCRIPTION
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0109	A	1	SENDER-WATER TEMP
E4			1	FUEL PUMP
E5	150-1406	A	1	SENSOR-SPEED (MAG)(REF)
G1			1	ALTERNATOR & REGULATOR
K1			1	SOLENOID-ENG STOPPING
K2			1	SOLENOID-WATER
K3			1	SOL-ENG STOPPING
K4			1	SOLENOID-AIR INLET
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP
S3			1	SWITCH-LOW WATER TEMP
S4			1	SWITCH-LOW OIL PRESS (PRE-ALARM)
S3			1	SWITCH-HI WATER TEMP (PRE-ALARM)
	813-0096	-	2	SCREW-RHM 10-32 x 1/4 LG

CONTROL BOX PARTS LIST

REF DES	PART NO		QTY	DESCRIPTION
A11	300-0964	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0953	C	1	MODULE-ENGINE MONITOR
A13	300-0955	C	1	MODULE-REMOTE INDICATOR
A14	300-0977	C	1	MODULE-STANDARD CRANKER
	300-0956	C	1	MODULE-CYCLE CRANKER
A15	300-0987	C	1	MODULE-BYPASS PLUG
	300-0973	B	1	MODULE-TD START-STOP
A16	300-0957	C	1	MODULE-OVERSPEED SEN
A17	300-0958	C	1	MODULE-STARTER DISC
CR11,12	357-0004	A	2	DIODE (REF)
DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0119	A	1	LAMP-OVERCRANK
DS13	322-0123	A	1	LAMP-OVERSPEED
OS14	322-0120	A	1	LAMP-LOW OIL PRESS
OS13	322-0121	A	1	LAMP-HI ENG TEMP
DS16	322-0122	A	1	LAMP-LO ENG TEMP
K11	307-1056	B	1	RELAY-START DISCONNECT
K12	307-1056	B	1	RELAY-IGNITION
K13	307-0061	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
	307-1157	P	3	SPRING-RELAY HOLDDOWN (K11,12,14)
K15	307-1056	B	1	RELAY-OVERSPEED
	323-0920	B	1	SOCKET ASSY-RELAY
M11	193-0107	B	1	GAUGE-OIL PRESSURE (-01 TO -12)
M12	193-0108	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	193-189	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01, -02, -04, -05,
				-07, -08, -10, -11)
	308-0347	A	1	SWITCH-SELECTOR (PENN STATE)
S13	308-0337	A	1	SWITCH-LAMP TEST
S14	308-0051	P	1	SWITCH-ALARM RESET
TB11	332-1005	A	1	TERMINAL BLOCK (REF)
	332-1539	A	1	MARKER STRIP
TB12,14	332-0537	A	2	TERMINAL BLOCK (REF)
	332-1239	A	1	MARKER STRIP (TB12)
	332-1561	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-RHM 8-32 1/2 LG
TB13	332-0669	A	1	TERMINAL BLOCK (REF)
	332-1560	A	1	MARKER STRIP
	338-0914	D	1	WIRING HARNESS
W12	336-1918	A	1	LEAD ASSY (STD CONT ONLY)
	545-0026	A	1	PARTS LIST-CONT HDW (ENG)
	301-3621	D	1	BRACKET-ENG CONTROL
	301-3629	C	1	PANEL-ENG CONTROL
	301-3588	D	1	RACK-MODULE
	301-3635	B	1	COVER ASSY-RACK
	815-0368	-	4	SCREW-SLTD HWH TAPPING 8 3/8 LG
	323-0814	P	14	GUIDE-PC BD
	98-2342	B	1	SILKSCREEN (-01, -02, -04, -05, -07,
				-08, -10, -11)
	98-2543	B	1	SILKSCREEN (PENN STATE)
	98-2544	B	1	SILKSCREEN

* WHEN USED

THIS INFO FOR MANUFACTURING ONLY

		STD CRANKER	CYCLE CRANKER	STD CRANKER	CYCLE CRANKER
		BYPASS PLUG	BYPASS PLUG	TIME DELAY START STOP	TIME DELAY START STOP
DHA	STD CONTROL	-01	-04	-07	-10
	PRE-ALARM	-02	-05	-08	-11
	PENN STATE	-03	-06	-09	-12

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DHA-R/9222 A

DATE 9-25-74

CONTROL-GEN SET ENG (24V DIESEL) (WIRING DIAGRAM)

2 WIRE REMOTE STARTING

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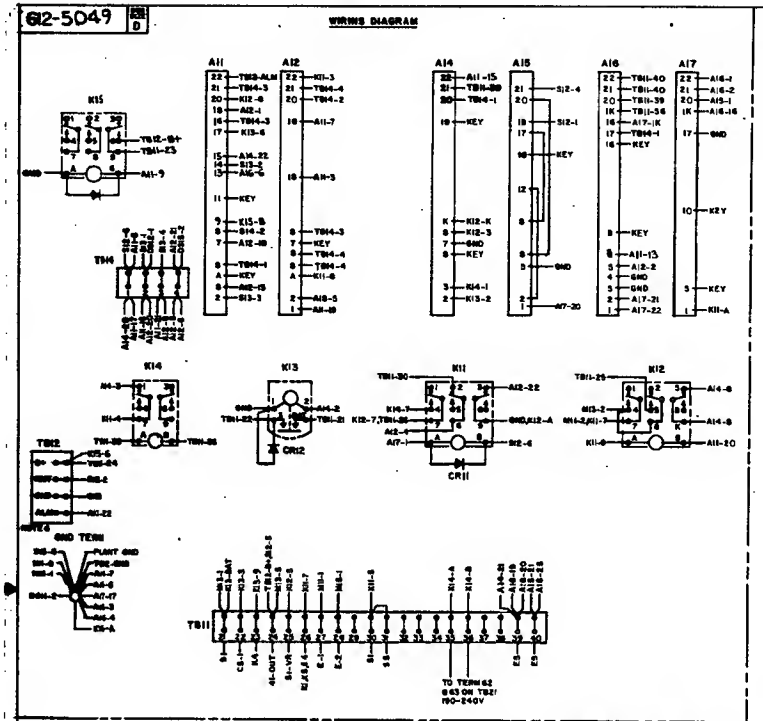
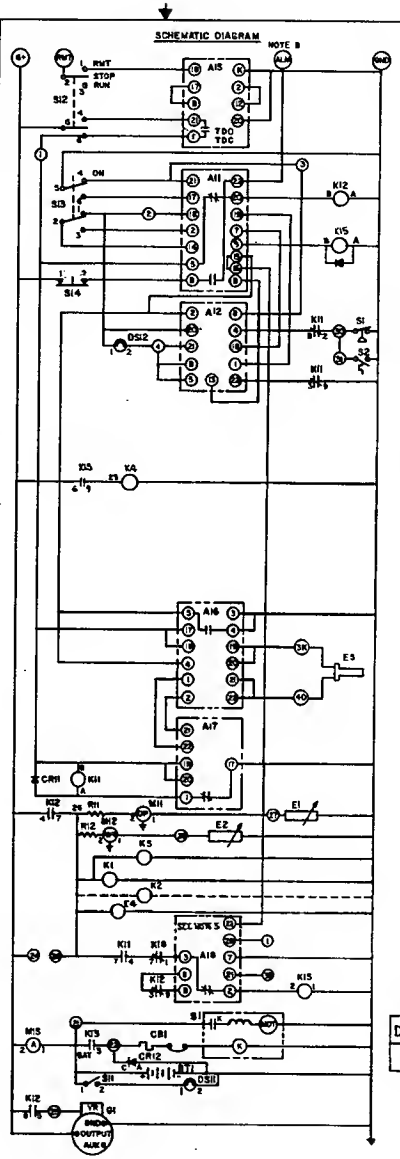
Rev. 7-75

612-5049 D

WIRING DIAGRAM



SCHEMATIC DIAGRAM



NOTES:

1. COMPONENTS CONNECTED WITH DASHED LINES ARE OPTIONAL ITEMS.
2. SHUTDOWN & ALARMS
   2.1 STD CONTROL
   2.1.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK. OVERSPEED. HI ENG TEMP & LO OIL PRESS
   2.2 PENN STATE CONTROL
   2.2.1 SAFETY SHUTDOWN & ALARM ON OVERCRANK & OVERSPEED
   2.2.2 SAFETY ALARM ON HI ENG TEMP & LO OIL PRESS
3. MAGNETIC SENSOR(ES) MOUNTED IN GEN END BELL AIR GAP SETTING .060/.050.
4. UNLESS OTHERWISE NOTED, ALL COMPONENTS SHOWN IN DE-ENERGIZED POSITION.
5. THE STANDARD CRANKER JUMPERS A18-2 TO A14-3 FOR STEADY CRANKING. THE CYCLE CRANKER ALTERNATELY OPENS AND CLOSES THIS CIRCUIT FOR A CRANK-REST-CRANK SEQUENCE.
6. REMOTE ALARM CIRCUIT RATED 5 AMP MAX
7. START STOP TD
   CAN BE ADJUSTED INDEPENDENTLY
   START---------0.5 TO 10 SECONDS
   STOP----------0.5 TO 5 MINUTES
   TOLERANCE----±20%
8. S15 MUST BE MOUNTED WITH SOLDER TERM UP
9. STARTER DISCONNECT 510 ± 60 RPM
   STARTER RECONNECT LESS THAN 30 RPM
   OVERSPEED SHUTDOWN 2100 ± 90 RPM

ENGINE

PARTS LIST (REF)

REF DES	PART NO	PT	QTY	DESCRIPTION
B1			1	STARTER & SOLENOID-ENGINE
BT1			1	BATTERY-24V
CB1	320-0240	P	1	CIRCUIT BREAKER, 12.5 AMP
E1	193-0108	A	1	SENDER-OIL PRESSURE
E2	193-0109	A	1	SENDER-WATER TEMP
E4			1	FUEL PUMP
E5	150-1A06	A	1	SENSOR-SPEED (MAG) (REF)
G1			1	ALTERNATOR & REGULATOR
K1			1	SOLENOID-ENG STOPPING
K2			1	SOLENOID-WATER
K5			1	SOL-ENG STOPPING
K6			1	SOLENOID-AIR INLET
S1			1	SWITCH-LOW OIL PRESSURE
S2			1	SWITCH-HIGH WATER TEMP

CONTROL BOX PARTS LIST

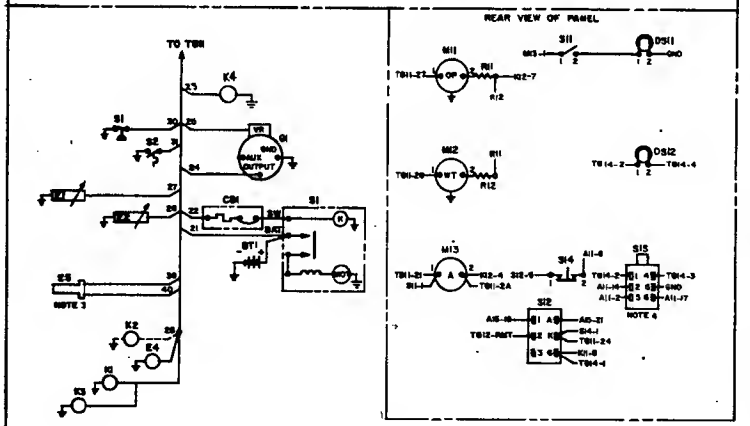
A11	500-0964	C	1	MODULE-ENGINE SHUTDOWN
A12	300-0963	C	1	MODULE-ENGINE MONITOR
A1A	300-0977	C	1	MODULE-STANDARD CRANKER
	500-0956	C	1	MODULE-CYCLE CRANKER
A15	500-0987	C	1	MODULE-BYPASS PLUG
	500-0973	B	1	MODULE-TD START-STOP
A16	300-0967	C	1	MODULE-OVERSPEED SEN
A17	500-0958	C	1	MODULE-STARTER DISC
CR11,12	55T-0004	A	2	DIODE (REF)
DS11	322-0017	-	1	LAMP-PANEL
	322-0149	P	1	HOLDER-LAMP
DS12	322-0129	A	1	LAMP-FAULT
	815-0096	-	2	SCREW-PHM 10-32, 1/4LG
K11	507-1058	B	1	RELAY-START DISCONNECT
K12	507-1058	B	1	RELAY-IGNITION
K13	307-0961	B	1	RELAY-START SOLENOID
K14	307-1061	B	1	RELAY-STARTER PROTECTION
	307-1157	P	3	SPRING-RELAY HOLDDOWN(K11,12,14)
K15	307-1056	B	1	RELAY-OVERSPEED
	323-0920	B	1	SOCKET ASSY-RELAY
M11	185-0107	B	1	GAUGE-OIL PRESSURE (-01TO-08)
M12	193-0108	B	1	GAUGE-WATER TEMP
M13	302-0061	A	1	AMMETER-CHARGE 30-0-30
R11,12	185-0189	P	2	RESISTOR-GAUGE
S11	308-0002	-	1	SWITCH-PANEL LIGHT
S12	308-0220	P	1	SWITCH-SELECTOR (-01,-03,-05,-07)
	308-0347	A	1	SWITCH-SELECTOR (PENN STATE)
S15	308-0357	A	1	SWITCH-LAMP TEST
S14	308-0098	P	1	SWITCH-ALARM RESET
TB11	332-1006	A	1	TERMINAL BLOCK (REF)
	332-1069	A	1	MARKER STRIP
TB12,14	332-0037	A	2	TERMINAL BLOCK (REF)
	332-125K	A	1	MARKER STRIP (TB12)
	332-1581	A	1	MARKER STRIP (TB14)
	812-0079	-	2	SCREW-PHM 8-32 1/2LG
	538-0915	D	1	WIRING HARNESS
	545-0026	A	1	PARTS LIST-CONT MOW (ENG)
	340-3621	D	1	BRACKET-ENG CONTROL
	501-3681	D	1	PANEL-ENG CONTROL
	501-5588	D	1	RACK-MODULE
	501-5655	B	1	COVER ASSY-RACK
	815-0388	-	4	SCREW-STD HWH TAPPING 8 3/8LG
	525-DHA	P	12	GUIDE-PC BD
	98-25A2	B	1	SILKSCREEN (-01,-03,-05,-07)
	98-25A3	B	1	SILKSCREEN (PENN STATE ONLY)
	98-25A5	B	1	SILKSCREEN

THIS INFO FOR MANUFACTURING ONLY

		STD CRANKER BYPASS PLUG	CYCLE CRANKER BYPASS PLUG	STD CRANKER TIME DELAY START STOP	CYCLE CRANKER TIME DELAY START STOP
DHA	STD CONTROL	-01	-03	-05	-07
	PENN STATE	-02	-04	-06	-08

* WHEN USED

REAR VIEW OF PANEL



612-5049

PO	S1	S2	S5	S6	PARTS
✓	✓	✓	✓	✓	✓

DHA-R/1A

2 WIRE REMOTE STARTING

9-25-74

CONTROL-GEN SET ENGINE (DIESEL) (WIRING DIAGRAM)

612-5049 D

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Rev. 7-75